

DOCUMENT RESUME

ED 216 126

CE 032 079

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TITLE Diesel Mechanics. Post Secondary Curriculum Guide.
INSTITUTION Georgia Univ., Athens. Div. of Vocational Education.
SPONS AGENCY Georgia State Dept. of Education, Atlanta. Office of Adult and Vocational Education.
PUB DATE 81
NOTE 667p.
EDRS PRICE MF03/PC27 Plus Postage.
DESCRIPTORS *Auto Mechanics; Behavioral Objectives; Competence; Course Descriptions; Definitions; *Diesel Engines; *Educational Facilities; Educational Objectives; Educational Philosophy; Employment Potential; Individualized Instruction; *Industrial Arts; *Instructional Development; Instructional Materials; Job Skills; Learning Activities; Mechanical Skills; Models; Postsecondary Education; Records (Forms); Resources; State Curriculum Guides; Student Evaluation; *Technical Education; Vocational Education
IDENTIFIERS Georgia; Special Needs Students

ABSTRACT

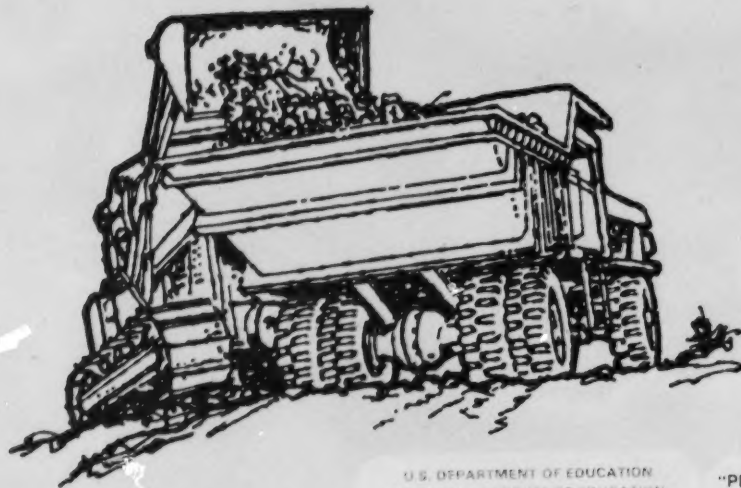
Intended to provide a model for organizing vocational instructional content, this curriculum guide consists of information pertinent to conducting a postsecondary level course in diesel mechanics. While the guide is primarily oriented towards the classroom, whether as a primary resource or as a supplement to other teaching materials, it may also assist administrators, counselors, and lay people involved in local school systems. Following an introductory discussion of state and local philosophy and objectives underlying vocational education, occupational information is provided concerning diesel mechanics. Presented next are a series of unit guides, each of which contains a task statement, a performance objective, instructional activities, suggested instructional materials, and evaluation criteria. The next two sections consist of a sample curriculum structure and course outline and various student records. Described next are group and individualized instruction facilities. The three appendixes contain a list of instructional resources and resource addresses, material for use in working with special needs students, and definitions. (MN)

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DIESEL MECHANICS

Post Secondary



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CURRICULUM GUIDE

Georgia Department of Education

ED216126

CE-032 079

DIESEL MECHANICS

Developed Under Contractual Agreement with

Division of Program Development
Office of Vocational Education
Georgia Department of Education
Atlanta, Georgia 30334

Charles McDaniel, State Superintendent of Schools
1981

DIESEL MECHANICS

Developed By

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Under the Direction of

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POLICIES AND PROCEDURES FOR THE CENTER

PURPOSE OF THE CENTER

The Vocational Education Materials Center functions within the division of Vocational Education, University of Georgia. This Center operates under grants from the U.S. Office of Education, and the Georgia State Department of Education with the support of the College of Education. The Center is comprehensive in its commitment and approach to the development and dissemination of materials in the broad field of Vocational Education.

The purpose of the Center is to increase the capability of Georgia's delivery system for Vocational Education. Specifically, the Center is committed to:

1. Develop materials to assist in the implementation of proposed curricula and to enhance the teaching Vocational Education.
2. Conduct and report curriculum research related to Vocational Education.
3. Provide a production and dissemination center to Vocational Education materials.
4. Provide direct experiences in curriculum development and diffusion for advanced graduate students.
5. Enable faculty members to participate in the development and implementation of a variety of curriculum materials.

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PURPOSE AND UTILIZATION OF THE CURRICULUM GUIDES

The purpose of this curriculum guide is to provide a suggested model for organizing vocational instructional content. In many cases, more material is available than may be needed, therefore, an instructor will need to adapt the content to meet his/her program needs.

While the guide is primarily oriented towards the classroom, whether as a primary resource or as a supplement to other teaching materials; it may also assist administrators, counselors and lay people involved in local school systems. The following outline provides an overview of the various ways these groups may utilize the curriculum guides.

a) Vocational teachers.

1. Provide a guide for organizing their program of instruction,
2. Assist in establishing program objectives,
3. Serve as a curriculum materials resource guide,
4. Improve communications with employers and advisory committees
5. Facilitate competency based instruction,
6. Facilitate either group or self-paced instruction,
7. Include content by quarter and semester,
8. Cross-reference with existing state developed instructional materials (PLACE packages and post secondary I.I.).

b) Vocational supervisors and administrators.

1. Assist in defining the scope and content of their programs,
2. Provide a means to improve curriculum management functions,
3. Serve as a guide for admissions and job placement functions,
4. Improve communications with employers and advisory committees.

c) Counseling and guidance staff.

1. Provide a data base for counseling and guidance personnel,
2. Identify student exit points (Career Options),
3. Serve as guide for admissions and job placement,

4. Correlate with new State Board of Education graduation requirements,
5. Provide specific content sequencing by quarter and semester for student scheduling,
6. Provide (a) curriculum options for the disadvantaged handicapped student, (b) curriculum modifications for SPECIAL NEEDS students, (c) typical admission requirements for regular and SPECIAL NEEDS students.

(d) Local Curriculum Coordination Committees.

1. Serve as a guide in working out articulation arrangements,
2. Improve definitions of the relationship between secondary clusters and post secondary specialized programs.

Vocational teachers, supervisors and administrators, counseling and guidance staff and local curriculum coordination committees will be primary users of this guide, however, the use of the guide is not limited to these groups, but by any and all groups directly related in designing a vocational curriculum.

-Foreword-

It has been the privilege of the Division of Vocational Education, University of Georgia, to participate in the development of 48 curriculum guides for Georgia vocational education programs. This work was sponsored by the Division of Program Development, Office of Vocational Education, State Department of Education. The completion of these guides meets a long standing need to provide a comprehensive curriculum overview of the vocational education programs available in Georgia schools. This developmental activity involved one of the largest professional staffs ever assembled for such work. Numerous teachers, teacher educators and state staff members have either written parts of the guides or served on the field review teams. These professionals were supported by a myriad of technical people and a host of typists who literally worked from dawn to dusk to ensure that the guides were produced in a timely fashion.

Be assured that this guide is not intended to be your curriculum or the curriculum of any school. The purpose of this project staff, and I am sure of the state OVE staff, is to offer a guide with supporting resources and teaching ideas from which the vocational instructor can extract a curriculum that meets local needs. The guide, however, does simplify curriculum decisions concerning sequencing and the selection of resources and media support.

The Task Linkage Project and appropriate V'TECS catalogs were used as the beginning point for this guide and all of the others. To assure that these task listings were directly related to Georgia vocational education programs and industry, they were subjected to additional study and review by appropriate teachers.

At some point in the future, this guide will need to be revised. To ensure that such a revision truly reflects the needs of Georgia's vocational education programs, the developers need your reactions, comments and ideas. We will also be interested in how you use this guide. Let us hear from you.

Paul Scott
Curriculum Guide Projects I & II

SECTION I

PHILOSOPHY, PURPOSE & OBJECTIVES

SECTION I

Section I Content List

State Philosophy and Goals
Local Philosophy and Goals

Section I provides an overview of the philosophies, purposes and goals for vocational education in the State of Georgia. These are applied to vocational education at the postsecondary level, however, it is recognized that more specific philosophies, purposes and goals will be applicable depending on the character of the local program.

VOCATIONAL EDUCATION IN GEORGIA

A. PHILOSOPHY

The Georgia Board of Education perceives vocational education as a vital component in the education of the young and adult citizens of this State. Appropriate programs of vocational education and ancillary services should be made readily available to individuals in middle schools, vocational divisions of junior colleges, vocational centers, the Quick Start program and other adult programs designed to train or retrain workers for useful and satisfying employment.

Special services and assistance must be provided to those who need it in order to participate or benefit from vocational education. This includes women, minorities, the displaced homemaker and other displaced workers, those with limited English-speaking ability, the disadvantaged and the handicapped.

Since men and women spend the greater part of their lives at some form of work, the State should provide opportunities for all its citizens to develop the knowledge, skills and attitudes necessary for them to secure personally satisfying and socially useful employment.

B. PURPOSE

The purpose of vocational education shall be to improve the economic well-being of Georgia citizens by preparing individuals, through organized learning experiences, to select, obtain and advance in recognized occupations.

POSTSECONDARY VOCATIONAL EDUCATION

A. PURPOSE

The purpose of postsecondary vocational-technical education in Georgia is to improve the economic well-being of adult citizens by providing access to high quality vocational-technical training for skilled and semi-skilled occupations, for improvement of existing skills or for retraining in a new occupation.

B. OBJECTIVES

1. To provide vocational-technical education programs and ancillary services commensurate with the needs and interests of students and available job opportunities.
2. To provide vocational-technical education programs which are current with the state-of-the-art, competency-based, and offer multiple exit points to accommodate the students' occupational objectives.
3. To provide vocational-technical education programs which are articulated with available high school counterparts, to facilitate an easy transition from secondary to postsecondary levels without loss of credit.
4. To provide vocational-technical education programs such that 75% of those individuals who leave or complete a program of occupational preparation will find employment in the field, or a related field, for which trained.
5. To provide those guidance, counseling, financial aid, evaluative, job placement, remedial and other supportive programs and services needed by students to enroll, complete a program and become, or remain, employable in a skilled or semi-skilled occupation.
6. To provide needed assistance to special populations to include women, minorities, limited English-speaking, the displaced homemaker and other displaced workers, the disadvantaged and the handicapped.
7. To provide vocational-technical education programs for full-time and part-time students on campus during the day as well as the evening hours, and to provide appropriate programs for full-time and part-time students off campus in businesses and industries, comprehensive high schools and other locations within the respective schools' service areas.
8. To serve as a center for the delivery of postsecondary and adult vocational-technical education programs and services for the community and assigned service area.

STATEMENT OF LOCAL SYSTEM PHILOSOPHY, PURPOSE
AND OBJECTIVES FOR VOCATIONAL EDUCATION

(This page is intentionally left blank so that local systems may insert their copy of philosophy, purpose and goals for vocational education.)

SECTION II

PROGRAM DESCRIPTION & RELATED INFORMATION

SECTION II

Section II Content List

Employability Skills
Diesel Mechanics Occupational Description
Diesel Mechanics Program Objective
Definition of the D.O.T. Code
Description of Diesel Mechanics D.O.T.
Task Listing by D.O.T. Code

The major goal of vocational education in Georgia is to prepare individuals, through organized learning experiences, to select, obtain and advance in recognized occupations. Section II provides an overview of employability skills that are desirable in any occupation and relates their significances to the specific occupational area of Diesel Mechanics.

The Diesel Mechanics Program Objective contains the specific occupational titles. These occupational titles are further explained in the description of the occupational exit points and task listing. The concentration of the program is based on these tasks.

EMPLOYABILITY SKILLS

Employability skills exert a great deal of influence on a person's ability to get and keep a job. Surveys indicate that more people lose their jobs because of poor attitudes toward their job than for lack of job skills. For this reason it is important that information concerning the following employability skills be provided as an ongoing part of the program.

1. Getting a job
 - a. Filling out job applications
 - b. Developing a resume
 - c. Preparing for a job interview
2. Keeping a job
 - a. Be on time and regular in attendance
 - b. Maintain a fair share of the work-load
 - c. Work without supervision
 - d. Meet production schedules
 - e. Properly care for and use equipment
 - f. Dress appropriately for the job
 - g. Maintain good personal hygiene
 - h. Develop and maintain good communication with supervisors and co-workers

A recent study sponsored by the Illinois Department of Adult, Vocational and Technical Education and conducted by the University of Illinois, "Survival Skills: Mastering the Human Aspects of Work", has identified twelve topics that might be developed into instructional modules for teaching occupational survival skills. The author, Robert E. Nelson, outlines these topics listed below and on the next page, each followed by a general objective which indicates the relationship between the topic and the survival skills required to maintain a job.

- *"1. Working in an Organization: To familiarize students with the reasons for the formation of organizations and the common characteristics of organizations.
2. Understanding Self and Others: To have students develop insights into causes of human behavior and learn to interpret their own behavior and the behavior of other.

3. Motivation for Work: To have students develop and understanding of motivations into the work they perform.
4. Interpersonal Relations: To have students develop concepts and skills in interpersonal relations and apply them to work situations.
5. On-the-Job Communication: To have students understand the importance of effective communication and learn ways of communicating effectively on the job.
6. Using Creativity on the Job: To make students aware of their creative potential and to practice using their creative ability in hypothetical on-the-job situations.
7. Authority and Responsibility: To have students develop an understanding of the concepts of authority, power, influence, and responsibility as they apply to work situations.
8. Problem Solving: To have students develop skill in applying problem solving to their work.
9. Coping with Organizational Change: To make students aware of the process of organizational change and the techniques for coping with organizational change.
10. Coping with Organizational Conflict: To make students aware of the sources and types of conflicts encountered on the job and recognize ways of coping with conflicts in an organization.
11. Leadership: To have students recognize the need for leadership in work groups and increase their understanding of the leadership role in work situations.
12. Adapting and Planning for the Future: To have students develop perspectives of work in the future and the ability to plan for anticipated changes in their work roles."

*Abstracted from the article, "Survival Skills: Mastering the Human Aspects of Work," by Robert E. Nelson, American Vocational Journal, November 1977.

TRUCK AND BUS MECHANICS*

Nature of the Work

Commercial vehicles serve an important function in the Nation's economy. Heavy trucks are used by industries such as mining and construction to carry ore and building materials and by commercial trucking lines for general freight hauling. Small trucks are used for local hauling. Buses are used for both local and transcontinental transportation, as well as for shipping some goods. Truck and bus mechanics keep these vehicles in good operating condition.

Truck and bus mechanics work on both diesel and gasoline engines. Diesel engines are found mostly in heavy trucks and buses, although growing numbers of lighter trucks, buses, and even cars are being built with diesels because of their durability and better gas mileage.

Mechanics who work for organizations that maintain their own vehicles may spend much time doing preventive maintenance to assure safe operation, prevent wear and damage to parts, and reduce costly breakdowns. During a maintenance check, they usually follow a regular check list that includes the inspection of brake systems, steering mechanisms, wheel bearings, and other important parts. If a part is not working properly, they usually can repair or adjust it. If it cannot be fixed, it is replaced.

In many shops mechanics do all kinds of repair work. For example, they may work on a vehicle's electrical system, one day and do major engine repair the next. In some large shops, however, mechanics specialize in one or two types of repair work. For example, one mechanic may specialize in major engine repair,

another in transmission work, another in electrical systems, and yet another in suspension or brake systems.

Truck and bus mechanics use a variety of tools in their work. They use power tools such as pneumatic wrenches to remove bolts quickly; machine tools such as lathes and grinding machines to rebuild brakes and other parts; welding and flame cutting equipment to remove and repair exhaust systems and other parts; common handtools such as screwdrivers, pliers, and wrenches to work on small parts and reach hard-to-get places; and jacks and hoists to lift and move large parts. Truck and bus mechanics also use a variety of testing equipment. For example, when working on electrical systems, they may use ohmmeters, ammeters, and voltmeters; to locate engine malfunctions, they often use tachometers and dynamometers.

For heavy work, such as removing engines and transmissions, two mechanics may work as a team, or a mechanic may be assisted by an apprentice or helper. Mechanics generally get their assignments from shop supervisors or service managers who may check the mechanics' work or assist in diagnosing problems.

Working Conditions

Truck and bus mechanics usually work indoors, although they may occasionally work or make repairs on the road. They are subject to the usual shop hazards such as cuts and bruises. Mechanics handle greasy and dirty parts and may stand or lie in awkward or cramped positions to repair vehicles. Work areas usually are well lighted, heated, and ventilated, and many employers provide locker rooms and shower facilities.

Places of Employment

A large proportion of the estimated 140,000 truck mechanics employed in 1978 worked for firms that owned fleets of trucks. Fleet owners include trucking companies and businesses that haul their own products such as dairies and bakeries. Other employers include truck dealers, truck manufacturers, truck repair shops, firms that rent or lease trucks, and Federal, State, and local governments.

Most of the estimated 22,000 bus mechanics employed in 1978 worked for local transit companies and intercity buslines. Bus manufacturers employed a relatively small number of mechanics.

Truck and bus mechanics are employed in every section of the country, but most work in large towns and cities where trucking companies, buslines, and other fleet owners have large repair shops.

Training, Other Qualifications, and Advancement

Most truck or bus mechanics learn their skills on the job. Beginners usually do tasks such as cleaning parts, fueling, and lubrication. They may also drive vehicles in and out of the shop. As beginners gain experience and as vacancies become available, they usually are promoted to mechanics' helpers. In some shops, beginners-especially those having prior automobile repair experience-start as mechanics' helpers.

Most helpers can make minor repairs after a few months' experience and advance to increasingly difficult jobs as they prove their ability. Generally, at least 3 to 4 years of on-the-job experience are necessary to qualify as an all-round truck or bus mechanic. Additional training may be necessary for

mechanics who wish to specialize in diesel engines.

Most training authorities recommend a formal 4-year apprenticeship as the best way to learn these trades. Typical apprenticeship programs for truck and bus mechanics consist of approximately 8,000 hours of shop training to obtain practical experience working on transmissions, engines, and other components and at least 576 hours of classroom instruction to learn blueprint reading, mathematics, engine theory, and safety. Frequently, these programs include training in both diesel and gasoline engine repair.

For entry jobs, employers generally look for applicants who have mechanical aptitude and are at least 18 years of age and in good physical condition. Completion of high school is an advantage in getting an entry mechanic job because employers believe such a person has at least some traits of a good worker, such as reliability and perseverance. Employers do not want to spend a lot of time and money training mechanics only to see them quit. To drive trucks or buses on public roads, applicants may need a State chauffeur's license.

Persons interested in becoming truck or bus mechanics can gain valuable experience by taking high school or vocational school courses in automobile and diesel repair. Science and mathematics help a mechanic understand how trucks and buses operate. Practical experience in automobile repair in a gasoline service station or the Armed Forces or from a hobby also is valuable.

Most mechanics must buy their own handtools. Experienced mechanics often invest hundreds of dollars in tools.

Employers sometimes send experienced mechanics to special training classes conducted by truck, bus, diesel engine, and parts manufacturers. In these classes, mechanics learn to repair the latest equipment or receive special training in subjects such as diagnosing engine malfunctions. Mechanics also must read service and repair manuals to keep abreast of engineering changes.

Experienced mechanics who have leadership ability may advance to shop supervisors or service managers. Truck mechanics who have sales ability sometimes become truck sales representatives. Some mechanics open their own gasoline service stations or repair shops.

Employment Outlook

Employment of truck mechanics is expected to increase faster than the average for all occupations through the 1980's as a result of significant increases in the transportation of freight by trucks. More trucks will be needed for both local and intercity hauling due to the increased production of goods and the necessity of transporting them greater distances and to more places as both populations and industrial centers spread out. In addition to the jobs created by transportation growth, many openings will arise to replace truck mechanics who retire, die, or transfer to other occupations.

Bus mechanics employment is expected to increase about as fast as the average for all occupations through the 1980's as the number of buses on the Nation's roads increases. More buses will be needed for local travel due to increased emphasis on mass transit systems. Intercity bus travel, on the other hand, is

expected to remain about the same. Most job openings will result from the need to replace bus mechanics who retire, die or transfer to other occupations.

Sources of Additional Information

More details about work opportunities for truck or bus mechanics may be obtained from local employers such as trucking companies, truck dealers, or bus lines; locals of unions previously mentioned; or the local office of the State employment service. Local State employment service offices also may have information about apprenticeships and other training programs.

For general information about the work of truck mechanics and apprenticeship training, write to:

American Trucking Associations, Inc., 1616 P Street, NW,
Washington, D.C., 20036.

Automotive Service Industry Association, 444 North Michigan
Avenue, Chicago, Illinois, 60611.

DIESEL MECHANICS PROGRAM OBJECTIVE

Given appropriate instruction, as suggested by this guide, a student completing the Diesel Mechanics program should demonstrate entry level skills in truck, bus and heavy duty equipment repair including gas and diesel engines, in the areas of knowledge, theoretical structure, tool usage, diagnostic ability, related supportive skills and occupational survival skills.

As the student progresses through the program, sufficient competencies will be acquired to enable the student to enter the occupational field at the following D.O.T. Codes.*

Tune-Up Mechanic	(D.O.T. Code 620.281-066)
Brake Repairer	(D.O.T. Code 620.281-026)
Auto Mechanic Helper, (truck and bus)	(D.O.T. Code 620.684-014)
Auto Mechanic, (truck and bus)	(D.O.T. Code 620.261-010)
Diesel Mechanic Helper	(D.O.T. Code 625.684-010)
Diesel Mechanic	(D.O.T. Code 625.281-010)
Fuel Injection Servicer	(D.O.T. Code 625.281-022)

*Dictionary of Occupational Titles, 1977 ed.

DEFINITION OF D.O.T. CODE*

As a result of technological, economic and sociological influences, nearly every job in the economy is performed slightly differently from any other job. Every job is also similar to a number of other jobs. In order to look at the millions of jobs in an organized way, job titles are designated a 9-digit occupational code. Each set of three digits in the D.O.T. Code has a specific purpose or meaning that differentiates it from all other codes.

The first three digits of the D.O.T. Code identify a particular occupational group. In the code 652.382-010, the first digit indicates an occupational category. The second digit refers to a division within the occupational category. The third digit defines a specific occupational group within a division.

The middle three digits of the D.O.T. Code 652.382-010 are the worker function rating of the tasks performed in the occupation. Every job requires a worker to function, to some degree, in relation to data, people and things. A separate digit expresses the worker's relationship to each of these three groups. Worker functions involving more complex responsibility and judgment are assigned lower numbers while functions which are less complicated have high numbers.

The last three digits of the D.O.T. Code 652.382-010 indicate the alphabetical order of titles within 6-digit code groups. They serve to differentiate a particular occupation from all others. A number of occupations may have the same first six digits, but no two D.O.T. Code can have the same nine digits.

*Dictionary of Occupational Titles, 1977 ed.

DESCRIPTION OF OCCUPATIONAL EXIT POINTS*

620.281-066 TUNE-UP MECHANIC (auto. ser.)

Tunes automotive vehicle engines to insure efficient operation: Removes spark plugs, using socket wrench, and tests them, using spark plug tester. Cleans electrodes in sandblasting machine, sets spark gap with feeler gage, and replaces or installs new plugs. Inspects distributor breaker points for wear and pits, using feeler gage, and replaces or resets points. Observes ignition timing, using timing light, and adjusts timing, using handtools. Adjusts carburetor needle setting, using handtools, and verifies adjustment, using instruments, such as fuel analyzer, vacuum gage, oscilloscope, and tachometer. Sets valve tappets, using feeler gage or dial indicator. Replaces defective coils, condensers, and pump. Examines battery and connections and electrical charging and starting circuit. Adjusts and repairs fan belt and fuel and water pumps. May tune engine while vehicle runs on rollers connected to dynamometer and be designated as DYNAMOMETER TUNER (auto. ser.).

620.281-026 BRAKE REPAIRER (auto. ser.) brake mechanic; brake repair mechanic, brakeshoe repairer

Repairs and overhauls brake systems in automobiles, buses, trucks, and other automotive vehicles: Pushes handle of hydraulic jack or pushes hoist control to raise vehicle axle. Removes wheels, using brakeshoe units or attaches new linings to brakeshoes. Measures brakedrum to determine amount of wear, using feeler gage. Inserts vacuum gage into powerbrake cylinder, starts engine, and reads gage to detect brakeline leaks. Repairs or replaces leaky brake cylinders. Repairs or replaces defective air compressor in airbrake systems. Replaces wheel on axle and adjusts drumshoe clearance using wrench. Fills master brake cylinder with brake fluid, pumps brake pedal, or uses pressure tank, and opens valves on hydraulic brake system to bleed air from brake lines. Closes valves and refills master brake cylinder. May be designated according to specialty as BRAKE REPAIRER, AIR (auto. ser.); BRAKE REPAIRER, HYDRAULIC (auto. ser.); BRAKE REPAIRER, BUS (auto. ser.).

620.684-014 AUTOMOBILE MECHANIC HELPER (auto. ser.) automobile mechanic assistant; mechanic helper

Assists AUTOMOBILE MECHANIC (auto. ser.) in repairing automobiles, buses, trucks, and other automotive vehicles: Raises vehicles to specified level, using hydraulic jack. Removes and disassembles unit, such as engine, transmission, or differential, to be repaired, using handtools and power tools. Cleans unit, using prescribed solvent. Lubricates and washes vehicle. Performs other duties as described under HELPER (any ind.). May be designated according to specialty of worker assisted as TRUCK MECHANIC HELPER (auto. ser.).

620.261-010 AUTOMOBILE MECHANIC (auto. ser.) garage mechanic

Repairs and overhauls automobiles, buses, trucks, and other automotive vehicles: Examines vehicle and discusses with customer or AUTOMOBILE REPAIR SERVICE ESTIMATOR (auto. ser.); AUTOMOBILE TESTER (auto. ser.); or BUS INSPECTOR (auto. ser.) nature and extent of damage or malfunction. Plans work procedure, using charts, technical manuals, and experience. Raises vehicle, using hydraulic jack or hoist, to gain access to mechanical units bolted to underside of vehicle. Removes unit, such as engine, transmission, or differential, using wrenches and hoist. Disassembles unit and inspects parts for wear, parts, such as pistons, rods, gears, valves, and bearings, using mechanic's handtools. Overhauls or replaces carburetors, blowers, generators, distributors, starters, and pumps. Rebuilds parts, such as crankshafts and cylinder blocks, using lathes, shapers, drill presses, and welding equipment. Rewires ignition system, lights, and instrument panel. Relines and adjusts brakes, aligns front end, repairs or replaces shock absorbers, and solders leaks in radiator. Mends damaged body and fenders by hammering out or filling in dents and welding broken parts. Replaces and adjusts radios, heaters, mirrors, and windshield wipers. May be designated according to speciality as AUTOMOBILE MECHANIC, MOTOR (auto. ser.); BUS MECHANIC (auto. ser.); DIFFERENTIAL REPAIRER (auto. ser.); ENGINE REPAIR MECHANIC, BUS (auto. ser.); FOREIGN CAR MECHANIC (auto. ser.); TRUCK MECHANIC (auto. ser.). When working in service station may be designated AUTOMOBILE SERVICE STATION MECHANIC (auto. ser.).

625.684-010 DIESEL MECHANIC HELPER (any ind.)

Assists DIESEL MECHANIC (any ind.) in overhauling and maintaining diesel motors used to operate trucks, generators, and other equipment: Disassembles motor and cleans parts. Obtains parts from stock and hands tools to mechanic. Assists in reassembly, and cleans tools and working area. Performs other duties as described under HELPER (any ind.).

625.281-010 DIESEL MECHANIC (any ind.)

Repairs and maintains diesel engines used to power machines, such as buses, ships, trucks, railroad trains, electric generators, and construction machinery, using handtools, precision-measuring instruments, and machine tools: Diagnoses trouble, disassembles engines, and examines parts for defects and excessive wear. Reconditions and replaces parts, such as pistons, bearings, gears, valves, and bushings, using engine lathes, boring machines, handtools, and precision-measuring instruments. May weld and cut parts, using arc-welding and flame cutting equipment. May be designated according to type of diesel engine or equipment repaired as DIESEL-ENGINE MECHANIC, AUTOMOBILE (auto. ser.); DIESEL-ENGINE MECHANIC, BUS (auto. ser.); DIESEL-ENGINE MECHANIC, TRUCK (auto. ser.); DIESEL-MECHANIC, CONSTRUCTION (const.); DIESEL-MECHANIC, FARM (agric. equip); LOCOMOTIVE REPAIRER, DIESEL (loco. & car bldg. & rep.).

625.281-022 FUEL-INJECTION SERVICER (any ind.)

Rebuilds, tests, and calibrates fuel injection units as used on diesel engines, railroad locomotives, trucks, construction equipment, tractors, and power plants: Studies repair order and disassembles unit to determine cause of malfunction. Refinishes defective parts, using lapping machine to grind and smooth nozzle point and seat. Replaces parts which cannot be refinished. Assembles and tests nozzle assemblies, using test equipment.

*Dictionary of Occupational Titles, 1977 ed.

TASK LISTING BY D.O.T. CODE

In this section the occupational exit points from the curriculum are cross referenced with the tasks which are required for employment in each job title. On the line following each task an x appears in the column of each job title to which to task applies. All the tasks listed in this matrix are taught in the curriculum presented in this guide. A detailed treatment of each task appears in the Unit Guides section of this curriculum guide.

TASK LISTING BY DOT CODE

DIESEL MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	POSSIBLE EXIT POINTS							
		DOT NO.	DOT DESCRIPTIONS						
		620.281-066	Tune-up Mechanic						
		620.281-026	Brake Repairer						
		620.684-014	Auto Mechanic Helper (truck and bus)						
		620.261-010	Auto Mechanic (truck and bus)						
		625.684-010	Diesel Mechanic Helper						
		625.281-010	Diesel Mechanic						
		625.281-022	Fuel Injection Servicer						
	BASIC FUNDAMENTALS								
	DUTY A - Related Instruction								
RI-01	Demonstrating and utilizing school and shop policies and procedures		X	X	X	X	X	X	
RI-02	Maintaining a parts inventory		X	X	X	X	X	X	
RI-03	Reading and interpreting the shop service manuals		X	X	X	X	X	X	
RI-04	Completing job work order forms		X	X	X	X	X	X	
RI-05	Identifying and maintaining shop tools and equipment		X	X	X	X	X	X	
RI-06	Using precision measurement tools and equipment		X	X	X	X	X	X	
RI-07	Demonstrating engine theories of operation		X	X	X	X	X	X	
RI-08	Demonstrating a knowledge of electricity fundamentals		X	X	X	X	X	X	
RI-09	Demonstrating a knowledge of fuels		X	X	X	X	X	X	
RI-10	Demonstrating a knowledge of lubricants		X	X	X	X	X	X	

TASK LISTING BY DOT CODE

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		625.684-010	Diesel Mechanic Helper							
		625.281-010	Diesel Mechanic							
		625.281-022	Fuel Injection Servicer							
RI-11	Demonstrating a knowledge of hardware and fasteners			X	X	X	X	X	X	
RI-12	Demonstrating basic metal operations			X	X	X	X	X	X	
RI-13	Demonstrating welding and soldering techniques			X	X	X	X	X	X	
RI-14	Demonstrating a knowledge of applied mathematics			X	X	X	X	X	X	
RI-15	Demonstrating a knowledge of applied science			X	X	X	X	X	X	
RI-16	Non-destructive testing of engine parts			X	X	X	X	X	X	
	HEAVY DUTY SERVICE AND REPAIR									
	DUTY A - Perform Service Checks									
HD-01	Checking and changing engine oil and oil filter			X	X	X	X	X	X	

TASK LISTING BY DOT CODE

DIESEL MECHANICS

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		625.281-010	Diesel Mechanic					
		625.281-022	Fuel Injection Servicer					
HD-02	Checking fluid level and refilling transmission and rear end		X	X	X	X	X	
HD-03	Lubricating chassis and components		X	X	X	X	X	
HD-04	Checking and replacing windshield wiper blades		X	X	X	X	X	
HD-05	Repairing tires and tubes			X	X	X	X	
HD-06	Replacing light bulbs and fuses		X	X	X	X	X	X
HD-07	Washing and waxing vehicle		X	X	X	X	X	
HD-08	Performing state inspection		X	X	X	X	X	
	DUTY B - Service, Maintain and Repair the Starting System							
HD-09	Servicing battery and cables		X		X	X	X	
HD-10	Replacing and rebuilding solenoids and switches		X		X	X	X	
HD-11	Removing and replacing the starter		X		X	X	X	
HD-12	Disassembling and inspecting the starter components		X			X		X
HD-13	Reconditioning the starter components		X			X		X

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DIESEL MECHANICS

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		620.261-010	Auto Mechanic (truck and bus)						
		625.684-010	Diesel Mechanic Helper						
		625.281-010	Diesel Mechanic						
		625.281-022	Fuel Injection Servicer						
HD-14	Reassembling and testing the starter	X				X		X	
HD-15	Diagnosing starting system problems	X				X		X	
	DUTY C - Service, Maintain and								
	Repair the Charging System								
HD-16	Testing the DC generator and regulator								
		X		X	X	X	X		
HD-17	Testing the alternator and regulator	X		X	X	X	X		
HD-18	Removing, disassembling and inspect-								
	ing the generator	X		X			X		
HD-19	Rebuilding the generator	X		X			X		
HD-20	Removing, disassembling and inspect-								
	ing the alternator	X		X			X		
HD-21	Rebuilding the alternator	X		X			X		
HD-22	Removing and replacing generators								
	and alternators	X		X	X	X	X		
HD-23	Diagnosing and charging system								
	problems	X		X			X		

TASK LISTING BY DOT CODE

DIESEL MECHANICS

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		620.261-010	Auto Mechanic (truck and bus)					
		625.684-010	Diesel Mechanic Helper					
		625.281-010	Diesel Mechanic					
		625.281-022	Fuel Injection Servicer					
	DUTY D - Service, Maintain and							
	Repair the Heating and Cooling							
	System							
HD-24	Checking coolant level and freezing							
	point	X		X	X	X	X	
HD-25	Cleaning and flushing the system	X		X	X	X	X	
HD-26	Inspecting, adjusting or replacing							
	fan belts and hoses	X		X	X	X	X	
HD-27	Testing system with pressure	X		X	X	X	X	
HD-28	Removing, repairing and replacing							
	the radiator or heat exchanger	X			X		X	
HD-29	Testing and replacing thermostats							
	and radiator caps	X		X	X	X	X	
HD-30	Replacing the variable speed fan	X			X		X	
HD-31	Replacing the water pump	X			X		X	
HD-32	Repairing the heater controls				X		X	
HD-33	Removing, repairing and replacing							
	the heater core				X		X	
HD-34	Diagnosing cooling system problems				X		X	

TASK LISTING BY DOT CODE

DIESEL MECHANICS

TASK NO.	TASK NAME	POSSIBLE EXIT POINTS							
		DOT NO.	DOT DESCRIPTIONS	620.281-066	620.281-026	620.684-014	620.261-010	625.684-010	625.281-010
	DUTY E - Service, Maintain and		Tune-up Mechanic						
	Repair the Braking System		Brake Repairer						
			Auto Mechanic						
			Helper (truck and bus)						
			Auto Mechanic (truck and bus)						
			Diesel Mechanic Helper						
			Diesel Mechanic						
			Fuel Injection Servicer						
HD-35	Identifying brake system components			X	X	X			
HD-36	Adjusting brakes			X	X	X			
HD-37	Removing and rebuilding brake cylinders/air chambers			X		X			
HD-38	Removing and rebuilding brake calipers			X		X			
HD-39	Replacing brake shoes and pads			X		X			
HD-40	Machining brake drums			X		X			
HD-41	Machining brake rotors			X		X			
HD-42	Replacing hydraulic control or air valves and lines			X		X			
HD-43	Replacing power brake units			X		X			
HD-44	Diagnosing brake system problems			X		X			

TASK LISTING BY DOT CODE

DIESEL MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	DOT NO.	DOT DESCRIPTIONS
		620.281-066	Tune-up Mechanic
		620.281-026	Brake Repairer
		620.684-014	Auto Mechanic Helper (truck and bus)
		620.261-010	Auto Mechanic (truck and bus)
		625.684-010	Diesel Mechanic Helper
		625.281-010	Diesel Mechanic
		625.281-022	Fuel Injection Servicer
	DUTY F - Service, Maintain and Repair the Suspension System		
HD-45	Identifying suspension system components		X X X
HD-46	Inspecting suspension system components		X X X
HD-47	Lubricating and adjusting front wheel bearings		X X X
HD-48	Replacing shock absorbers		X X X
HD-49	Replacing front coil springs and rear leaf springs		X X X
HD-50	Changing and balancing wheels and tires		X X X
HD-51	Replacing upper and lower control arms and bushings		X
HD-52	Replacing upper and lower ball joints		X
HD-53	Replacing king pins and bushings		X
HD-54	Replacing torsion bars		X
HD-55	Replacing twin I-beams		X

TASK LISTING BY DOT CODE

DIESEL MECHANICS

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		DOT NO.	DOT DESCRIPTIONS					
		620.281-066	Tune-up Mechanic					
		620.281-026	Brake Repairer					
		620.684-014	Auto Mechanic Helper (truck and bus)					
		620.261-010	Auto Mechanic (truck and bus)					
		625.684-010	Diesel Mechanic Helper					
		625.281-010	Diesel Mechanic					
		625.281-022	Fuel Injection Servicer					
HD-56	Diagnosing suspension system problems					X		
	DUTY G - Service, Maintain and Repair the Steering System							
HD-57	Identifying steering components		X	X	X			
HD-58	Adjusting manual steering gear		X	X	X			
HD-59	Inspecting and replacing steering gear linkage					X		
HD-60	Replacing power steering unit					X		
HD-61	Replacing steering column					X		
HD-62	Aligning the front end					X		
HD-63	Diagnosing steering problems					X		
	DUTY H - Service and Repair the Exhaust System							
HD-64	Identifying emission control components		X		X	X	X	X

TASK LISTING BY DOT CODE

DIESEL MECHANICS

TASK LISTING BY DOT CODE		POSSIBLE EXIT POINTS	
DIESEL MECHANICS		DOT NO.	DOT DESCRIPTIONS
HD-65	Removing and replacing exhaust pipes, mufflers and tail pipes	620.281-066	Tune-up Mechanic
HD-66	Diagnosing emissions control and exhaust system problems	620.281-026	Brake Repairer
		620.684-014	Auto Mechanic Helper (truck and bus)
		620.261-010	Auto Mechanic (truck and bus)
		625.684-010	Diesel Mechanic Helper
		625.281-010	Diesel Mechanic
		625.281-022	Fuel Injection Servicer
ACCESSORIES			
DUTY A - Test and Maintain Electrical Circuits			
AC-01	Replacing wiring and making splices	X	
AC-02	Testing and maintaining electrical protection devices	X	
AC-03	Testing and repairing the courtesy light circuit		X
AC-04	Testing and repairing the parking light and marker lamp circuits		X
AC-05	Testing and repairing the back-up light circuit		X
AC-06	Testing and repairing the headlight circuit		X

TASK LISTING BY DOT CODE

DIESEL MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	POSSIBLE EXIT POINTS							
		DOT NO.	DOT DESCRIPTIONS	620.281-066	Tune-up Mechanic	620.281-026	Brake Repairer	620.684-014	Auto Mechanic Helper (truck and bus)
AC-07	Testing and repairing the turn signal circuit								X
AC-08	Testing and repairing the brake light circuit							X	
AC-09	Testing and repairing the horn circuit							X	
AC-10	Testing and repairing the windshield wiper circuit (air or electric)							X	
AC-11	Testing and repairing the windshield washer circuits							X	
AC-12	Testing and replacing instrument gauges and sending units							X	
AC-13	Testing and repairing the CB radio power circuit							X	
AC-14	Testing and trimming the radio antenna							X	
AC-15	Testing and repairing fog lights							X	

TASK LISTING BY DOT CODE

DIESEL MECHANICS

POSSIBLE EXIT POINTS

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		625.281-010	Diesel Mechanic						
		625.281-022	Fuel Injection Servicer						
	DUTY B - Test and Maintain the Air Conditioning System								
AC-16	Testing system performance					X			
AC-17	Discharging the system					X			
AC-18	Evacuating and charging the system					X			
AC-19	Rebuilding compressors					X			
AC-20	Replacing refrigerant lines and accessories					X			
AC-21	Installing air conditioning units					X			
AC-22	Diagnosing air conditioning problems					X			
	POWER TRAINS								
	DUTY A - Service, Maintain and Repair the Manual Transmission								
PT-01	Adjusting and repairing clutch and shift linkage					X			

TASK LISTING BY DOT CODE

DIESEL MECHANICS

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		625.281-010	Diesel Mechanic						
		625.281-022	Fuel Injection Servicer						
PT-02	Removing and disassembling trans-								
	mission					X			
PT-03	Inspecting and reassembling trans-								
	mission					X			
PT-04	Removing and replacing clutch								
	assembly					X			
PT-05	Removing and replacing flywheel								
	ring gear					X			
PT-06	Diagnosing manual transmission								
	problems					X			
	DUTY B - Service, Maintain and								
	Repair the Drive Line and Differen-								
	tial								
PT-07	Inspecting the drive shaft					X			
PT-08	Removing and replacing universal								
	joints					X			
PT-09	Removing and replacing constant								
	velocity joints					X			

TASK LISTING BY DOT CODE

DIESEL MECHANICS

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		620.281-066	Tune-up Mechanic					
		620.281-026	Brake Repairer					
		620.684-014	Auto Mechanic					
		620.261-010	Helper (truck and bus)					
		625.684-010	Auto Mechanic (truck and bus)					
		625.281-010	Diesel Mechanic Helper					
		625.281-022	Diesel Mechanic					
			Fuel Injection Servicer					
PT-10	Removing and replacing rear axle bearings					X		
PT-11	Removing and disassembling differential assembly					X		
PT-12	Inspecting and reassembling differential assembly					X		
PT-13	Removing and replacing front drive axle assembly					X		
PT-14	Rebuilding the four wheel drive locking hubs					X		
PT-15	Rebuilding the four wheel drive transfer case					X		
PT-16	Diagnosing drive line and rear end problems					X		
	DUTY C - Service, Maintain and Repair the Automatic Transmission							
PT-17	Testing the automatic transmission					X		
PT-18	Inspecting and adjusting shift linkage					X		

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		625.281-010	Diesel Mechanic					
		625.281-022	Fuel Injection Servicer					
PT-19	Removing and replacing the transmission oil filter					X		
PT-20	Testing and replacing the vacuum modulator					X		
PT-21	Removing and disassembling transmission					X		
PT-22	Inspecting and reassembling transmission					X		
PT-23	Testing transmission on bench					X		
PT-24	Removing and replacing torque					X		
PT-25	Diagnosing automatic transmission problems					X		
INTERNAL COMBUSTION ENGINE OVERHAUL								
DUTY A - Recondition Valves								
IC-01	Determining engine condition	X			X		X	X
IC-02	Identifying cylinder head component parts	X		X	X	X	X	X
IC-03	Adjusting the valves	X		X	X	X	X	X

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IC-04	Removing the cylinder head			X	X	X	X	
IC-05	Removing and inspecting valves			X			X	
IC-06	Refacing the valves and valve stems			X			X	
IC-07	Inspecting the cylinder head			X			X	
IC-08	Grinding the valve seats			X			X	
IC-09	Servicing the rocker arm, push rod and lifter assemblies							
IC-10	Reassembling and replacing the cylinder head(s)				X		X	
IC-11	Diagnosing problems in the valve train				X		X	
	DUTY B - Replace Timing Chain and/or Gears (Engine in Vehicle)							
IC-12	Removing component parts				X		X	
IC-13	Removing vibration damper				X		X	
IC-14	Removing front cover				X		X	
IC-15	Removing and replacing timing chain(s) and/or gears				X		X	
IC-16	Replacing front cover and seal				X		X	

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IC-17	Diagnosing timing chain problems					X		X	
	DUTY C - Install a Short Block								
	Assembly								
IC-18	Removing engine from vehicle					X		X	
IC-19	Removing and inspecting usable parts					X		X	
IC-20	Assembling new and used parts on								
	block assembly					X		X	
IC-21	Installing engine assembly					X		X	
IC-22	Testing engine assembly					X		X	
IC-23	Diagnosing internal engine failure					X		X	
	DUTY D - Rebuild Engine Block								
	Assembly								
IC-24	Disassembling an internal combustion engine					X	X	X	X
IC-25	Cleaning and inspecting block and components					X		X	
IC-26	Preparing cylinder block					X		X	

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DIESEL MECHANICS

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		625.281-022	Fuel Injection Servicer					
IC-27	Installing cam bearings				X		X	
IC-28	Installing piston pins and rings				X		X	
IC-29	Installing crankshaft				X		X	
IC-30	Installing liners, pistons and rod bearings							
					X		X	
IC-31	Installing oil pump, oil pan and component parts							
					X		X	
	GASOLINE ENGINES							
	DUTY A - Service, Maintain and Repair the Fuel System							
GS-01	Adjusting fuel/air mixtures and mechanical linkage							
		X			X	X	X	
GS-02	Cleaning or replacing fuel and air filters							
		X		X	X	X	X	X
GS-03	Removing carburetor from engine							
		X		X	X			
GS-04	Disassembling, cleaning and inspecting carburetor							
		X			X			
GS-05	Reassembling and testing carburetor							
		X			X			

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		625.281-010	Diesel Mechanic						
		625.281-022	Fuel Injection Servicer						
GS-06	Testing and replacing fuel pump	X						X	X
GS-07	Servicing fuel tank, lines, hoses and fuel level monitoring devices	X			X			X	X
GS-08	Diagnosing fuel system problems	X			X			X	X
	DUTY B - Service, Maintain and Repair the Ignition System								
GS-09	Inspecting, selecting and installing spark plugs	X		X	X				
GS-10	Timing the ignition	X			X				
GS-11	Inspecting and replacing circuit wiring, distributor cap and rotor	X			X				
GS-12	Testing, removing and replacing battery ignition components	X			X				
GS-13	Testing, removing and replacing electronic ignition components	X			X				
GS-14	Using and interpreting the ignition analyzer	X			X				
GS-15	Diagnosing ignition system problems	X			X				

TASK LISTING BY DOT CODE

DIESEL MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	DOT NO.	DOT DESCRIPTIONS
		620.281-066	Tune-up Mechanic
		620.281-026	Brake Repairer
		620.684-014	Auto Mechanic Helper (truck and bus)
		620.261-010	Auto Mechanic (truck and bus)
		625.684-010	Diesel Mechanic Helper
		625.281-010	Diesel Mechanic
		625.281-022	Fuel Injection Servicer
	DUTY C - Service, Maintain and Repair Emissions Controls		
GS-16	Measuring exhaust emissions	X	X
GS-17	Testing and replacing components in the positive crankcase ventilation (PCV) system	X	X
GS-18	Testing and replacing components in the fuel evaporative control system	X	X
GS-19	Testing and replacing components in the exhaust gas recirculation (EGR) system	X	X
GS-20	Testing and replacing the catalytic converter	X	X
GS-21	Testing and replacing components in the thermostatic air cleaner system	X	X
GS-22	Testing and replacing components in the air injection reaction (AIR) system	X	X
GS-23	Testing and replacing components in the spark control system	X	X

TASK LISTING BY DOT CODE

DIESEL MECHANICS

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		620.261-010	Auto Mechanic (truck and bus)
		625.684-010	Diesel Mechanic Helper
		625.281-010	Diesel Mechanic
		625.281-022	Fuel Injection Servicer
DIESEL ENGINES			
	DUTY A - Engine Overhaul		
DE-01	Testing to determine engine condition		
			X X
DE-02	Performing major and minor tune-up		X X
DE-03	Reconditioning cylinder head		X
DE-04	Performing an in-frame overhaul		X
DE-05	Performing bench overhaul		X
	DUTY B - Diesel Engine Governors		
DE-06	Demonstrating governor principles of operation		X X
DE-07	Using correct terminology (governors)		X X
DE-08	Classifying governors		X X
DE-09	Adjusting hydraulic governors		X X
DE-10	Troubleshooting governors		X X

TASK LISTING BY DOT CODE

DIESEL MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	POSSIBLE EXIT POINTS							
		DOT NO.	DOT DESCRIPTIONS						
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		625.684-010	Diesel Mechanic Helper						
		625.281-010	Diesel Mechanic						
		625.281-022	Fuel Injection Servicer						
	DUTY C - Fuel Injection Systems								
DE-11	Identifying diesel fuel system components							X	X
DE-12	Disassembling, inspecting and reassembling the jerk pump							X	X
DE-13	Testing and calibrating multiple plunger injection pump							X	X
DE-14	Testing and calibrating the distributor type fuel injection pumps							X	X
DE-15	Reconditioning and adjusting the fuel injectors							X	X
DE-16	Troubleshooting the Cummins PT fuel system							X	X
DE-17	Repairing blowers, turbochargers and superchargers							X	X

SECTION III

UNIT GUIDES

SECTION III

Section III Content List

Unit Guide Description
Suggested Sequence of Unit Guides

In Section II, the relationship between the occupational area and program tasks was introduced. Section III continues this development by presenting, for each task, a unit guide for instructional planning and execution.

The instruction of specific tasks is central to vocational education. However, the value of a single task/competency to the student as a prospective member of the workforce is dependent upon the way in which that task/competency is related to other tasks and to the entire occupational area. Therefore, the Diesel Mechanics Program Task Listing provides a sample organizational model for sequencing the instruction of program tasks.

UNIT GUIDES DESCRIPTION

In this section the tasks to be taught in each block are presented in sequential order. Each task is listed on a separate page so that it may be taken out of the guide for daily lesson planning or regrouped with other tasks to fit the individual teacher's preference for teaching order. The task pages may be used for planning and executing group instruction or for individualized instruction.

Each page in the UNIT GUIDES section contains the following information:

TASK: This is a short and concise statement of the task to be taught.

PERFORMANCE OBJECTIVE: The performance expected of the student after completing the unit is stated in stem form, without a specific statement of all conditions, equipment and performance standard (these are listed in a criterion referenced measure in the Evaluation section of the task page). Definitions of terms used in the objective are as follows: (1) "Inspecting" - examining by sight and touch, (2) "Checking" - verifying proper operation, (3) "Troubleshooting" - analyzing and identifying malfunctions, (4) "Servicing" - performing functions that assure continued operation, (5) "Repairing" - correcting a defective condition (repairing a fuel injection system includes component replacement and adjustment, but not compo-

nent repair) and (6) "Overhauling" - disassembling, inspecting, repairing and checking operation.

INSTRUCTIONAL ACTIVITIES: Suggested learning activities are presented. These activities include providing information, demonstration, practical applications and projects.

INSTRUCTIONAL MATERIALS: Suggested materials for carrying out the instructional activities are listed. These include textbooks, audiovisuals and equipment. Textbooks are referenced by author and title with the complete reference contained in the textbook list in the Instructional Resources section.

EVALUATION: This section contains a criterion referenced measure and reference to any test items or other evaluation measures that are available to teacher.

CLASS/LAB HOURS: The estimated time for completion of the instructional activities and the evaluation are indicated in both classroom and lab hours. Total instructional time would be the sum of these.

DIESEL MECHANICS TASK INDEX

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RI-04	Completing job work order forms.....	21
RI-05	Identifying and maintaining shop tools and equipment.....	23
RI-06	Using precision measurement tools and equipment.....	25
RI-07	Demonstrating engine theories of operation.....	27
RI-08	Demonstrating a knowledge of electricity fundamentals.....	29
RI-09	Demonstrating a knowledge of fuels.....	31
RI-10	Demonstrating a knowledge of lubricants.....	33
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RI-12	Demonstrating basic metal operations.....	37
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RI-14	Demonstrating a knowledge of applied mathematics.....	41
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HD-03	Lubricating chassis and components.....	51
HD-04	Checking and replacing windshield wiper blades.....	53
HD-05	Repairing tires and tubes.....	55
HD-06	Replacing light bulbs and fuses.....	57
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HD-32	Repairing the heater controls.....	109

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(Engine in Vehicle)

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DUTY B: Service, Maintain and Repair the Ignition System

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GS-12	Testing, removing and replacing battery ignition components.....	357
GS-13	Testing, removing and replacing electronic ignition components.....	359
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DUTY C: Service, Maintain and Repair Emissions Controls

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GS-17	Testing and replacing components in the positive crankcase ventilation (PCV) system.....	367
GS-18	Testing and replacing components in the fuel evaporative control system.....	369
GS-19	Testing and replacing components in the exhaust gas recirculation (EGR) system.....	371
GS-20	Testing and replacing the catalytic converter.....	373
GS-21	Testing and replacing components in the thermostatic air cleaner system.....	375
GS-22	Testing and replacing components in the air injection reaction (AIR) system.....	377
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MAJOR BLOCK: DIESEL ENGINES

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DUTY B: Diesel Engine Governors

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DUTY C: Fuel Injection Systems

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DE-14	Testing and calibrating the distributor type fuel injection pumps.....	407
DE-15	Reconditioning and adjusting the fuel injectors.....	409
DE-16	Troubleshooting the Cummins PT fuel system.....	411
DE-17	Repairing blowers, turbochargers and superchargers....	413

TASK

RI-01 Demonstrating and utilizing school and shop policies and safety procedures

PERFORMANCE OBJECTIVE

Demonstrate an understanding of school and shop policies and procedures.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Program objectives
- b. Career opportunities
- c. Grading practices and procedures
- d. Safety
- e. Using audiovisual equipment
- f. Using the curriculum materials

Provide Demonstration On:

- a. Using audiovisual equipment
- b. Using curriculum materials
- c. Safe operating practices

Provide Practical Application On:

- a. Safety practices
- b. Using audiovisual equipment
- c. Using curriculum materials

INSTRUCTIONAL MATERIALS

Textbooks:

- a. AAVIM, Developing Shop Safety Skills
- b. Ohio State University, Shop Safety

A/Vs:

- a. AAVIM, "Developing Shop Safety Skills," slide/tape
- b. Bergwall "Shop Safety," filmstrips
- c. Cummins, "Safety Film Checklist," movie film; "Diesel Race Car," movie film

Student Manuals:

- a. Georgia, Auto Mechanics, Units 101-1, 101-2, 101-3, 101-4
- b. School Policies, Local Education Agency
- c. AAVIM, Developing Shop Safety Skills
- d. MAVCC, Diesel Engine Mechanics, A-II

Tools and Equipment:

A/V equipment (Caramate, etc)

LAB HOURS	4
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CLASS HOURS	2
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EVALUATION

(RI-01)

- a. Given the necessary information and equipment, the learner will describe the objectives of the program, identify at least five career opportunities, demonstrate correct use of A/V equipment and student manuals and pass the safety exam with 90% accuracy.
- b. Shop Safety, The Ohio State University, Trade and Industrial Education.

TASK

RI-02 Maintaining a parts inventory

PERFORMANCE OBJECTIVE

Identify, maintain and locate component parts using the parts manual.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Parts catalog
- b. Microfiche readers
- c. Parts request forms
- d. Locating parts in storeroom
- e. Maintaining stock
- f. Storing parts
- g. Identifying interchangeable parts
- h. Posting the parts catalog

Provide Demonstration On:

- a. Using the catalog
- b. Using the reader
- c. Looking up parts
- d. Recording part numbers
- e. Identifying interchangeable parts
- f. Posting the parts catalog
- g. Importance of maintaining "change pages" and accounting for insertion

Provide Practical Application On:

- a. Looking up parts in the catalog and reader
- b. Posting parts catalog

INSTRUCTIONAL MATERIALS

Textbooks:

General Motors Corp., Aids To Educators

Tools and Equipment:

- a. Microfiche reader
- b. Parts catalog
- c. Parts forms
- d. Assorted diesel catalogs

LAB HOURS	4
CLASS HOURS	2

EVALUATION

(RI-02)

- a. Given a model number and necessary parts catalog, the learner will identify a part specified by the instructor and locate the parts in the storage area with 100% accuracy.
- b. V'TECS, Auto Parts Catalog, Performance Guides.

TASK

RI-03 Reading and interpreting the shop service manuals

PERFORMANCE OBJECTIVE

Identify procedures and specifications for tasks outlined in the service manual.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Necessary data required
- b. Identifying the correct manual
- c. Specification charts
- d. Flat rate manuals
- e. Updating the manual

Provide Demonstration On:

- a. Locating data
- b. Reading specification charts
- c. Reading flat rate manuals
- d. Posting the manual

Provide Practical Application On:

- a. Identifying data
- b. Using specification charts
- c. Using flat rate manual
- d. Posting the manual

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Data plate
- b. Service manual
- c. Flat rate manual

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(RI-03)

Given a task and a model number, the learner will locate the task in the correct service manual and list the specifications required with 100% accuracy.

TASK

RI-04 Completing job work order forms

PERFORMANCE OBJECTIVE

Greet a customer and fill out the job work order form as per customer complaint.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Customer relations
- b. Obtaining data
- c. Filling out the form
- d. Verifying the complaint
- e. Maintaining records
- f. Labor costs
- g. Determining feasibility of repair

Provide Demonstration On:

- a. Greeting customers
- b. Acquiring pertinent information
- c. Figuring cost

Provide Practical Application On:

- a. Greeting customers
- b. Filling out the form with necessary information
- c. Figuring cost

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Repairable machine
- b. Job work order forms
- c. Parts catalog
- d. Service or shop manual
- e. Labor cost guide

LAB HOURS 2

CLASS HOURS 2

EVALUATION

(RI-04)

Given a customer complaint, job work order form and necessary information, the learner will complete the work order form and determine feasibility of repair.

TASK

RI-05 Identifying and maintaining shop tools and equipment

PERFORMANCE OBJECTIVE

Select the correct tool for a specific task and use in a safe manner.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Tool design
- b. Tool use and selection
- c. Storing equipment
- d. Maintaining fire protection equipment
- e. Repairing tools
- f. Using cleaning equipment

Provide Demonstration On:

- a. Selecting and using tools safely
- b. Repairing tools
- c. Fire codes
- d. Using cleaning equipment

Provide Practical Application On:

- a. Selecting and using tools
- b. Using cleaning equipment
- c. Repairing tools

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tools, Fasteners, and Measurements
- b. Stockel, Auto Mechanics Fundamentals

A/Vs:

- a. Bergwall, "Automotive Hand Tools Explained," filmstrip
- b. Prentice-Hall, "Auto Mechanics Tools and Basic Skills," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics, Vol. I
- b. MAVCC, Diesel Engine Mechanics, A-III

Tools and Equipment:

- a. Discarded parts
- b. Hand tools
- c. Steam cleaner
- d. Parts bath

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(RI-05)

Given a specific task, the learner will select a tool and demonstrate safe and proper use according to job specifications.

TASK

RI-06 Using precision measurement tools and equipment

PERFORMANCE OBJECTIVE

Measure clearances and wear allowances to .0001 of an inch of known value.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Measuring units
- b. Plastigage
- c. Micrometers
- d. Calipers
- e. Depth gauges
- f. Timing tools

Provide Demonstration On:

- a. Reading micrometers and calipers
- b. Using plastigage
- c. Using and reading depth tools
- d. Using and reading timing tools

Provide Practical Application On:

- a. Measuring tolerances requiring use of several different tools
- b. Setting up timing tools

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Starrett, How To Read, Use and Care For Micrometers and Vernier Gages
- b. Stockel, Auto Mechanics Fundamentals

A/Vs:

- a. Prentice Hall, "Machine Shop Bench Operations," filmstrip
- b. Cummins, "The Smallest Fraction," movie film

Student Manuals:

- a. Georgia, Metal Fabrication Cluster, Unit M-1
- b. MAVCC, Diesel Engine Mechanics, A-III

Tools and Equipment:

- a. Micrometers of various sizes
- b. Vernier calipers
- c. Plastigage
(Continued on back)

LAB HOURS 5

CLASS HOURS 3

EVALUATION

(RI-06)

Given an out of round crankshaft and necessary tools, equipment and specifications, the learner will determine useability of the part according to the manufacturer's specifications.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. Discarded parts to measure
- e. Timing tools
- f. Engine for timing set-up

TASK

RI-07 Demonstrating internal combustion engine theories of operation

PERFORMANCE OBJECTIVE

Identify and describe the purpose of each component of the gasoline and diesel engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Power terms
- b. Parts and components
- c. Principles of operation
- d. Differences between gas and diesel engines

Provide Demonstration On:

- a. Relationship of parts
- b. Engine operation
- c. Compare diesel and gas engines

Provide Practical Application On:

- a. Identifying parts
- c. Comparing diesel and gas engines

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Glenn, Auto Mechanics
- b. Kates and Luck, Diesel and High Compression Gas Engines
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Bergwall, "The Internal Combustion Engine Explained," filmstrip; "The Four-cycle Diesel Engine Explained," filmstrip

(Continued on back)

Student Manuals:

MAVCC, Diesel Engine Mechanics, B-I

Tools and Equipment:

- a. Engine cut-away (gas)
- b. Engine cut-away (diesel)
- c. Disassembled engine
- d. Shop manuals

LAB HOURS	4
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CLASS HOURS	6
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EVALUATION

(RI-07)

Given necessary tools, equipment and engine parts, the learner will (1) identify parts and components, (2) list the operational sequences and (3) determine whether parts belong to gasoline or diesel engines. This must be done with 80% accuracy.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Prentice-Hall, "The Introduction to the Diesel Engine," filmstrip
- c. Cummins, "Engines," movie film

TASK

RI-08 Demonstrating a knowledge of electricity fundamentals

PERFORMANCE OBJECTIVE

Utilize electrical fundamentals in constructing and testing circuits and computing Ohm's law and power formulas.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Electron theory
- b. Conductors and insulators
- c. Generating and storing electricity
- d. Ohm's law and power formulas
- e. Test meters
- f. Circuit and schematics
- g. Symbols
- h. Solenoids, switches and motors

Provide Demonstration On:

- a. Electron theory
- b. Generating electricity
- c. Wiring circuits
- d. Using test motors
- e. Testing electrical devices

Provide Practical Application On:

- a. Wiring and testing circuits
- b. Computing Ohm's law and power formula
- c. Testing electrical devices

INSTRUCTIONAL MATERIALS

Textbooks:

- a. AAVIM, Understanding Electricity
- b. Stokel, Auto Mechanic Fundamentals

A/Vs:

- a. AAVIM, "Understanding Electricity and Electrical Terms," slide set

(Continued on back)

Student Manuals:

MAVCC, Diesel Engine Mechanics, F-I

Tools and Equipment:

- a. Wiring board
- b. Test meters
- c. Small electric devices

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(RI-08)

Given a volt-ohmmeter, a schematic drawing and necessary tools and equipment, the learner will make the necessary wiring connections and record volts, ohms and amperage readings at five different points. All readings must be within 10% of known values.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Prentice-Hall, "Basic Automotive Service," film-strip; "Auto Mechanics Tools and Basic Skills," filmstrip
- c. Cummins, "Watts a VOM," movie film

TASK

RI-09 Demonstrating a knowledge of fuels

PERFORMANCE OBJECTIVE

Discriminate between types of fuels and match types with specific uses.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Safety
- b. Properties of fuels
- c. Selecting fuels
- d. Storing and handling fuels

Provide Demonstration On:

Storing and handling fuels

Provide Practical Application On:

Selecting and refueling an engine

INSTRUCTIONAL MATERIALS

Textbooks:

- a. AAVIM, Selecting and Storing Fuels and Lubricants
- b. Crouse, Automotive Mechanics
- c. Toldt, Diesel Fundamentals, Service, Repair

A/Vs:

- a. Shell, "Refinery Processes," movie film
- b. AAVIM, "Selecting and Storing Fuels and Lubricants," slide set/transparency

Student Manuals:

MAVCC, Diesel Engine Mechanics, B-II

Tools and Equipment:

- a. Fuels
- b. Fuel containers

LAB HOURS	4
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CLASS HOURS	2
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EVALUATION

(RI-09)

Given a selection of fuels and an engine, the learner will re-fuel the engine with the correct fuel with 100% accuracy.

TASK

RI-10 Demonstrating a knowledge of lubricants

PERFORMANCE OBJECTIVE

List the properties of lubricants and select lubricants for specific jobs.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Properties of lubricants
- b. Selecting lubricants
- c. Storing and handling lubricants
- d. Cleaning lubricants (filters)

Provide Demonstration On:

- a. Selecting lubricants
- b. Wear due to lack of or dirty lubricants

Provide Practical Application On:

Changing oil

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Mechanic Fundamentals
- c. Kates, Diesel and High Compression Gas Engines

A/Vs:

Shell, "The Lubrication of Rolling Bearings," movie film

Student Manuals:

MAVCC, Diesel Engine Mechanics, Section B, Unit III

Tools and Equipment:

- a. Various types of oil
- b. Various types of grease
- c. Oil filters

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(RI-10)

Given powered equipment, the learner will determine the proper lubricant for the engine and chassis. Selection of lubricants must meet manufacturer's specifications.

TASK

RI-11 Demonstrating a knowledge of hardware and fasteners

PERFORMANCE OBJECTIVE

Identify and install hardware and fasteners for specific jobs.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Identification of fasteners
- b. Fastener grades
- c. Sizing fasteners
- d. Torque values

Provide Demonstration On:

- a. Selecting and installing fasteners
- b. Tightening fasteners
- c. Torque wrench specifications from manual

Provide Practical Application On:

Selecting and installing fasteners and hardware

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tools, Fasteners and Measurements
- b. Stockel, Auto Mechanic Fundamentals

A/Vs:

Prentice-Hall, "Auto Mechanics Tools and Basic Skills," film-strip

Student Manuals:

MAVCC, Diesel Engine Mechanics

Tools and Equipment:

- a. Selection of fasteners
- b. Torque wrenches
- c. Sizing tools

(Other materials are available from local nut and bolt supply stores.)

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(RI-11)

Given a selection of fasteners, the learner will select and install the fastener and tighten according to manufacturer's specifications.

TASK

RI-12 Demonstrating basic metals operations

PERFORMANCE OBJECTIVE

Construct a threaded steel block of given specifications.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Cutting metals
- b. Filing and grinding
- c. Drilling holes
- d. Making threads
- e. Removing broken bolts and screws
- f. Loosening seized parts
- g. Installing threaded inserts

Provide Demonstration On:

- a. Using hack saws and files
- b. Selecting and using drills
- c. Threading stock
- d. Removing broken studs
- e. Loosening seized parts
- f. Installing threaded inserts

Provide Practical Application On:

- a. Constructing a threaded steel block
- b. Making threaded studs

INSTRUCTIONAL MATERIALS

A/Vs:

Prentice-Hall, "Machine Shop: Bench Operations," filmstrip

Student Manuals:

MAVCC, Diesel Engine Mechanics, Section A, Unit III

Tools and Equipment:

- a. Metal cutting tools
- b. Tap and die set
- c. Drills and drill bits
- d. Heat lamp or torch
- e. Threaded insert kit

LAB HOURS	8
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CLASS HOURS	2
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EVALUATION

(RI-12)

Given necessary tools and equipment, the learner will construct a thread gauge block and studs. All threaded holes must be at right angles to the gauge block and the studs must turn freely.

TASK

RI-13 Demonstrating welding and soldering techniques

PERFORMANCE OBJECTIVE

Cut and join two pieces of steel together using both gas and electric welding techniques.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Safety
- b. Metal composition
- c. Affects of heat
- d. Flux and filler rods

Provide Demonstration On:

- a. Electric welding
- b. Gas welding/brazing
- c. Cutting metal with a torch
- d. Soldering

Provide Practical Application On:

- a. Cutting welding metals using both gas and electric welding equipment
- b. Solder wiring using a soldering gun

INSTRUCTIONAL MATERIALS

Textbooks:

Althouse, Modern Welding

A/Vs:

- a. Delmar, "Basic Oxyacetylene Welding," film loop
- b. Bergwall, "Cutting and Welding - Gas and Electric," filmstrip

Student Manuals:

MAVCC, Diesel Engine Mechanics, H-I, II, III, IV

Tools and Equipment:

- a. Oxyacetylene outfit
- b. Electric welding outfit
- c. Soldering run
- d. Welding and soldering materials

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(RI-13)

- a. Given a gas welder and an electric welder, the learner will cut metal and perform a butt weld using each technique. The weld must conform to accepted practices. Given a soldering gun and equipment, the learner will join two copper wires together in accordance with accepted practices.
- b. Georgia, Metal Fabrication Cluster, Pre/Post Checks.

TASK

RI-14 Demonstrating a knowledge of applied mathematics

PERFORMANCE OBJECTIVE

Establish and apply fundamental skills in mathematics to the automotive and transportation trade.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Whole numbers
- b. Fractions
- c. Decimal equivalents
- d. Formulas
- e. Ratio and proportion
- f. Percentages and averages
- g. Measurements

Provide Demonstration On:

Using mathematics for the mechanics trades

Provide Practical Application On:

- a. Determining cubic inch displacement and cubic centimeter displacement
- b. Measuring and recording fractions in metric and English versions

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Georgia, Vocational Mathematics
- b. Olivio, Practical Problems in Mathematics for Specific Trades
- c. Wilton and Rogers, Shop Mathematics at Work
- d. Kates and Luck, Diesel and High Compression Gas Engines

Student Manuals:

Georgia, Vocational Mathematics

Tools and Equipment:

- a. Parts to be measured
- b. 6 inch rule, micrometers, etc.

A/Vs:

Prentice-Hall, "Metrics for Auto Mechanics," filmstrip

LAB HOURS 3

CLASS HOURS 3

EVALUATION

(RI-14)

Given an engine and necessary tools and equipment, the learner will determine the cubic inch and cubic centimeter displacement, calculate horsepower and determine wear tolerances.

TASK

RI-15 Demonstrating a knowledge of applied science

PERFORMANCE OBJECTIVE

Identify principles of science as related to mechanical technology.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. History of the internal combustion engine
- b. Work power and force
- c. The lever and gear principles
- d. Reducing friction
- e. Heat characteristics
- f. Gases and liquids
- g. High and low pressures
- h. Energy
- i. Atoms and molecules

Provide Demonstration On:

- a. Gear trains and levers
- b. Bearing construction
- c. Heat transfer
- d. Liquid transfer
- e. The venturi principle
- f. Total engine operation

Provide Practical Application On:

- a. Constructing simple machines
- b. Constructing electro-magnets

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Jensen, Related Science-Automotive Trades
- c. Dagel, Diesel Engine Repair

Tools and Equipment:

- a. Mock-up of gear train
- b. Roller, needle and ball bearing
- c. Engine cut-away

Student Manuals:

AAVIM, Ball and Roller Bearings

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(RI-15)

Given the necessary tools and equipment, the learner will construct a simple machine and a gear reduction device to specifications. The learner will construct an electro-magnet and list the laws and principles of energy, magnetism and movement. This must be done with 80% accuracy.

TASK

RI-16 Non-destructive testing of engine parts

PERFORMANCE OBJECTIVE

Use spot-chek, magna-flux and similar inspection techniques to insure the condition of an engine part.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Spot-chek kits
- b. Magna-flux testing
- c. Magnetic particle testing
- d. Total forces acting on head bolts, connecting rod and main bearing bolts
- e. invisible heat check cracking

Provide Demonstration On:

- a. Using Spot-chek kit
- b. Using magnetic particle and polarized light tests

Provide Practical Application On:

Using Spot-chek kit and polarized light (Zyglow)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Mechanic Fundamentals
- b. Dagel, Diesel Engine Repair

Tools and Equipment:

- a. Spot-chek kit
- b. Zyglow lamp kit
- c. Scrapers, wire brushes
- d. Hot tank

A/Vs:

- a. Bergwall, "How to Overhaul an Engine," filmstrip
- b. Cummins, "Steel Parts Fractures Failure Analysis," slides

LAB HOURS	4
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CLASS HOURS	6
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EVALUATION

(RI-16)

Given head bolts, main bearing bolts, connecting rod bolts, cylinder head or other parts, the learner will perform non-destructive tests to determine physical condition of parts. Determinations must be made with 100% accuracy.

TASK

HD-01 Checking and changing engine oil and oil filter

PERFORMANCE OBJECTIVE

Check oil and change oil filter.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Engine oils
- b. Oil filters
- c. Safety
- d. Tools and equipment
- e. Procedures

Provide Demonstration On:

- a. Twin post lift operation
- b. Removal and installation of oil filter
- c. Correct removal and torquing of drain plug

Provide Practical Application On:

- a. Reading dipstick
- b. Draining engine oil
- c. Removing and replacing filter
- d. Refilling crankcase
- e. Checking for leaks

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Remling, Basics
- b. Stockel, Auto Mechanic Fundamentals
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

- a. Georgia, "Servicing Engine Lubricating System," slide set
- b. Bergwall, "Lubrication Services," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 212-2
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Oil filter wrench
- c. Drain

(Continued on back)

LAB HOURS 3

CLASS HOURS 1

EVALUATION

(HD-01)

- a. Given an operational vehicle, tools and equipment, the learner will change oil and oil filter according to specifications given by manufacturer. There must be no evidence of oil leaks after engine is warmed up.
- b. Oklahoma, Auto Mechanics I.
- c. Bergwall, filmstrip questions.
- d. Textbooks include test questions.

INSTRUCTIONAL MATERIALS

A/Vs:

- c. Prentice-Hall, "Basic Automotive Service," filmstrip

Tools and Equipment:

- d. Twin post lift
- e. Oil spout
- f. Shop towels
- g. Fender covers

TASK

HD-02 Checking fluid level and refilling transmission and rear end

PERFORMANCE OBJECTIVE

Check fluid levels and refill transmission and rear end.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types and application of transmission fluids
- b. Viscosities of rear end lubricant
- c. Effects of temperature

Provide Demonstration On:

- a. Twin post lift operation
- b. Use of lube dispenser

Provide Practical Application On:

- a. Use of transmission level guage
- b. Pumping lube with lube dispenser

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Remling, Basics
- c. Stockel, Auto Mechanic Fundamentals

A/Vs:

- a. Bergwall, "Lubrication Services," filmstrip
- b. Prentice-Hall, "Basic Automotive Service," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Gear lube dispenser
- c. Transmission filler

LAB HOURS	2
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CLASS HOURS	1
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EVALUATION

(HD-02)

- a. Given an operational vehicle, tools and equipment, the learner will check fluid level of transmission and rear end and refill if needed. Upon completion there must be no evidence of leaks.
- b. Oklahoma, Auto Mechanics II.
- c. Bergwall, filmstrip questions.
- d. Textbooks include test questions.

TASK

HD-03 Lubricating chassis and components

PERFORMANCE OBJECTIVE

Lubricate the chassis and components of an automobile.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Chassis grease
- b. Lubricating equipment

Provide Demonstration On:

- a. Correct procedure on cleaning grease fittings before applying grease
- b. How to determine correct amount of grease to apply

Provide Practical Application On:

- a. Location of grease fittings on components
- b. Pumping correct amounts of grease into components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Remling, Basics
- b. Stockel, Auto Mechanic Fundamentals

Tools and Equipment:

- a. Grease gun
- b. Rags
- c. Vehicle

A/Vs:

- a. Bergwall, "Lubrication Services," filmstrip
- b. Prentice-Hall, "Basic Automotive Service," filmstrip

LAB HOURS

2

CLASS HOURS

1

EVALUATION

(HD-03)

- a. Given a vehicle, the learner will identify chassis components and determine the need of grease. The learner will apply grease according to manufacturer's specifications without damaging components or grease pockets.
- b. V'TECS, Automotive Mechanics, Task Nos. 36, 143, 147, 194, 195.

TASK

HD-04 Checking and replacing windshield wiper blades

PERFORMANCE OBJECTIVE

Check and replace worn windshield wiper blades.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Blade types
- b. Blade safety regulation
- c. Windshield wiper blade mechanisms

Provide Demonstration On:

- a. Blade inspection
- b. Blade removal

Provide Practical Application On:

- a. Inspecting blade for abrasions or tears
- b. Removing and replacing blade

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Mechanics

Tools and Equipment:

- a. Windshield wiper arm removing tool
- b. Shop manual
- c. Wiper blades

LAB HOURS 2

CLASS HOURS 1

EVALUATION

(HD-04)

- a. Given a vehicle, the learner will inspect the windshield wiper blades and replace according to procedures found in the shop manual.
- b. V'TECS, Automotive Mechanics, Task No. 1.

TASK

HD-05 Repairing tires and tubes

PERFORMANCE OBJECTIVE

Repair a leak in a tubeless tire and patch a tube.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Tire constructor
- b. Tire types
- c. Safety
- d. Types and sizes of plugs and patches

Provide Demonstration On:

- a. Patching tube type tire
- b. Patching tubeless type tire
- c. Hot and cold patches
- d. Using tire changing equipment

Provide Practical Application On:

- a. Locating air leak
- b. Patch tube with hot patch
- c. Patch tube with cold patch

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Toboldt, Automotive Encyclopedia
- b. Stockel, Auto Mechanic Fundamentals

A/Vs:

Prentice-Hall, "Basic Automotive Service," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Leak test tank
- b. Tire changer
- c. Marking crayon
- d. Buffing tool
- e. Plug applicator
- f. Stitching tool

LAB HOURS 2

CLASS HOURS 6

EVALUATION

(HD-05)

Given a tire with an air leak, the learner will plug or patch the tubeless tire and patch a hole in a tube. Each exercise will be tested in a test tank to determine success. Patched or plugged areas must not leak and tire must hold specified pounds per square inch recommended by manufacturer.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application

On:

- d. Plugging hole in tubeless tire with vulcanizing plug applicator
- e. Dismounting and remounting tire on rim

TASK

HD-06 Replacing light bulbs and fuses

PERFORMANCE OBJECTIVE

Check and replace burned out light bulbs and fuses.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Sizes and types of light bulbs
- b. Sizes and resistances of fuses
- c. Procedure to determine malfunction of fuse
- d. Electrical wiring diagrams

Provide Demonstration On:

- a. Blown or malfunctioning fuse
- b. Blown or malfunctioning light bulb
- c. Checking bulb and fuse circuits

Provide Practical Application On:

- a. Locating fuse box
- b. Locating light bulbs
- c. Removing fuses from holders
- d. Removing light bulbs from sockets

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Remling, Basics
- b. Stockel, Auto Mechanic Fundamentals

A/Vs:

Prentice-Hall, "Basic Automotive Service," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. VOM
- c. Test light
- d. Auto shop manual

LAB HOURS

4

CLASS HOURS

2

EVALUATION

(HD-06)

- a. Given an operational vehicle, the learner will test and replace defective bulbs and fuses according to specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 89, 97.

TASK

HD-07 Washing and waxing vehicle

PERFORMANCE OBJECTIVE

Wash and wax a vehicle.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Detergents
- b. Additives
- c. Waxes

Provide Demonstration On:

- a. Mixing solution for washing
- b. Washing a vehicle
- c. Wax application

Provide Practical Application On:

Washing and waxing a vehicle

INSTRUCTIONAL MATERIALS

Student Manuals:

Vehicle owner's manual

Tools and Equipment:

- a. Detergent
- b. Pail
- c. Wipe cloth
- d. Brushes
- e. Chamois

LAB HOURS 6

CLASS HOURS 1

EVALUATION

(HD-07)

Given a vehicle, the learner will wash and wax it, restoring its finish to manufacturer's recommendations.

TASK

HD-08 Performing state inspection

PERFORMANCE OBJECTIVE

Perform complete state safety inspection on a passenger car.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. State safety laws
- b. Inspecting station requirements
- c. Motor vehicle inspection rules
- d. Inspection forms and stickers
- e. Station monthly reports

Provide Demonstration On:

- a. Checking lighting systems
- b. Checking brake systems
- c. Checking exhaust systems
- d. Checking horn system
- e. Checking tires
- f. Checking steering system
- g. Checking windshield wiper blades and the windshield

Provide Practical Application On:

- a. Checking lights
- b. Checking brakes
- c. Checking exhaust system
- d. Checking horn
- e. Checking tires
- f. Checking steering

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Remling, Basics
- b. Crouse and Anglin, Motor Vehicle Inspection

Student Manuals:

- a. Georgia Department of Safety, Official Motor Vehicle Inspection Manual
- b. Oklahoma, Auto Mechanics I, II

Tools and Equipment:

- a. Heat light testing
- b. Equalization tester
- c. Brake living gauge
- d. Tire thread guage
- e. Hand tools
- f. Pry bar
- g. Floor jack

LAB HOURS 8

CLASS HOURS 2

EVALUATION

(HD-08)

- a. Given an operational vehicle, the learner will perform a complete safety inspection to comply with laws enforced by the State of Georgia.
- b. Oklahoma, Auto Mechanics, Vols. I and II.
- c. Textbooks include test questions.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application

On:

- g. Checking windshield wiper blades
- h. Checking windshield for cracks
- i. Filling out inspection form
- j. Filling out rejection form
- k. Writing station monthly report

TASK

HD-09 Servicing battery and cables

PERFORMANCE OBJECTIVE

Service battery and connecting cables.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Battery construction
- b. Battery maintenance and testing
- c. Cable maintenance and testing

Provide Demonstration On:

- a. Battery maintenance
- b. Battery testing
- c. Cable maintenance

Provide Practical Application On:

- a. Battery maintenance
- b. Testing battery
- c. Testing cable

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Mechanic Fundamentals
- d. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Testing and Servicing Storage Battery," slide set; filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 201-4
- b. Oklahoma, Auto Mechanics II
- c. MAVCC, Diesel Engine Mechanics, F-II

Tools and Equipment:

- a. Hand tools
 - b. Hydrometer
- (Continued on back)

LAB HOURS 3

CLASS HOURS 1

III-63

EVALUATION

(HD-09)

- a. Given an operational gas starting system and necessary tools and equipment, the learner will test and service the battery and cables according to standards in the auto shop repair manual or manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 102.

INSTRUCTIONAL MATERIALS**A/Vs:**

- b. Prentice-Hall, "Basic Automotive Service," filmstrip, "How the Automobile Works," filmstrip

Tools and Equipment:

- c. Volt-ammeter
- d. Battery service tools
- e. Shop repair manual

TASK

HD-10 Replacing and rebuilding solenoids and switches

PERFORMANCE OBJECTIVE

Replace and/or rebuild starting solenoids and ignition switches.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Solenoids
- b. Switches
- c. Starter wiring

Provide Demonstration On:

- a. Removing and replacing solenoids
- b. Rebuilding solenoids
- c. Removing and replacing switches

Provide Practical Application On:

- a. Removing and replacing solenoid
- b. Rebuilding solenoid
- c. Removing and replacing switch

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Dagel, Diesel Engine Repair

A/Vs:

- a. Bergwall, "Automotive Starting System Explained," filmstrip
- b. Georgia, "Servicing Cranking System Controls," slide set; filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 222-5
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Volt-ammeter
- c. Auto shop repair manual
- d. Solenoids and switches

LAB HOURS 6

CLASS HOURS 1

EVALUATION

(HD-10)

- a. Given an operational starting system and necessary tools and equipment, the learner will remove and rebuild solenoids and switches according to standards in the auto shop repair manual or manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 90, 91.

TASK

HD-11 Removing and replacing starters

PERFORMANCE OBJECTIVE

Remove and replace the starter.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Starter wiring
- b. Starter construction

Provide Demonstration On:

Removing and replacing starters

Provide Practical Application On:

Removing and replacing starter

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Service and Repair

A/Vs:

Bergwall, "The Automotive Starting System Explained," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics, F-III

Tools and Equipment:

- a. Hand tools
- b. Shop repair manual

LAB HOURS 4

CLASS HOURS 1

III-67

EVALUATION

(HD-11)

- a. Given an operational starting system and necessary tools and equipment, the learner will remove and replace the starter according to standards of the auto shop repair manual or manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task No. 91.

TASK

HD-12 Disassembling and inspecting the starting motor components

PERFORMANCE OBJECTIVE

Disassemble and inspect the starting system components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Starter circuits
- b. Starter operation
- c. Instrumentation

Provide Demonstration On:

- a. Disassembling starter
- b. Testing armature and field coils
- c. Testing commutator
- d. Checking brushings and brushes

Provide Practical Application On:

- a. Disassembling starter
- b. Testing armature and field coils
- c. Testing commutator
- d. Checking brushings and brushes

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Overhauling Cranking Motor (Delco-Remy)," slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 222-2, 222-3
- b. Ford, Battery and Starting System, Student Text
- c. Oklahoma, Auto Mechanics II
- d. MAVCC, Diesel Engine Mechanics, F-III

Tools and Equipment:

(Continued on back)

LAB HOURS	4
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CLASS HOURS	1
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EVALUATION

(HD-12)

- a. Given an operational starting system and necessary tools and equipment, the learner will disassemble and inspect the starter components according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 92.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Georgia, "Overhauling Cranking Motors (Ford Type)," slide set; "Overhauling Cranking Motors (Chrysler)," slide set
- c. Bergwall, "The Starting System Explained," film-strip
- d. Ford, "Battery and Starting Systems," slide set
- e. Prentice-Hall, "Servicing Automobile Electric Starters," filmstrip

Tools and Equipment:

- a. Hand tools
- b. Armature tester
- c. Ohmmeter
- d. Shop repair manual

TASK

HD-13 Reconditioning the starter components

PERFORMANCE OBJECTIVE

Rebuild the starting motor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Starter circuits
- b. Starter operations
- c. Instrumentation

Provide Demonstration On:

- a. Replacing bushings
- b. Testing armature and field coils
- c. Turning the commutator
- d. Replacing field coils
- e. Replacing the brushes

Provide Practical Application On:

- a. Completely overhauling the starter
- b. Turning commutator
- c. Replacing field coils
- d. Replacing bearings and brushes

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Wetzel, Automotive Diagnosis and Tune-Up
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Bergwall, "The Starting System Explained," film-strip

(Continued on back)

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics, F-III

Tools and Equipment:

- a. Hand tools
- b. Armature tester
- c. Armature lathe
- d. Ohmmeter
- e. Shop repair manual

LAB HOURS	4
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CLASS HOURS	1
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EVALUATION

(HD-13)

- a. Given an operational starter and necessary tools and equipment, the learner will recondition the starter components according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 92.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Georgia, "Setting Coaster," filmloop; "Setting Camber," filmloop; "Setting Toe-in and Straight Ahead," filmloop; "Inspecting and Aligning Front End," filmstrip

TASK

HD-14 Reassembling and testing the starter

PERFORMANCE OBJECTIVE

Reassemble and test the starter.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Starter circuits
- b. Starter operations
- c. Instrumentation

Provide Demonstration On:

- a. Reassembling the starter
- b. Testing the starter

Provide Practical Application On:

Reassembling and testing the starter

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Dagel, Diesel Engine Repair
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

Bergwall, "The Starting System Explained," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 223-2
- b. Oklahoma, Auto Mechanics II
- c. MAVCC, Diesel Engine Mechanics, F-III

Tools and Equipment:

- a. Hand tools

(Continued on back)

LAB HOURS 6

CLASS HOURS 0

EVALUATION

(HD-14)

- a. Given a tested, disassembled starter and necessary tools and equipment, the learner will reassemble and test the starter according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- b. Volt-ohmmeter
- c. Ampmeter
- d. Shop repair manual

TASK

HD-15 Diagnosing starting problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the starting system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Starter system
- b. Instrumentation

Provide Demonstration On:

- a. Diagnosing solenoids and switches
- b. Quick diagnosing techniques
- c. Using instruments to diagnosis starter system problems

Provide Practical Application On:

- a. Diagnosing solenoid
- b. Diagnosing switch
- c. Diagnosing starter
- d. Using instruments to diagnose starter problems

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Troubleshooting Cranking Systems," film-strip
- b. Bergwall, "Starting System Explained," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 222-I
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Volt-ohmmeter
- c. Ampmeter

(Continued on back)

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(HD-15)

- a. Given an operational engine with a faulty starting system and necessary tools and equipment, the learner will formulate a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 77.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. VAT 28 or VAT 40 or equal type equipment
- e. Shop repair manual

TASK

HD-16 Testing the DC generator and regulator

PERFORMANCE OBJECTIVE

Test the DC generator and regulator output.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Charging circuit
- b. Generator construction and theory
- c. Two types of DC generator circuits
- d. Cut-out relay
- e. Voltage regulator
- f. Current regulator

Provide Demonstration On:

- a. Generator output test
- b. Testing A and B type generator circuits
- c. Testing cut-out relay
- d. Testing voltage and current regulator

Provide Practical Application On:

- a. Testing A type generator
- b. Testing B type generator
- c. Testing cut-out relay
- d. Testing voltage regulator
- e. Testing current regulator

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Service and Repair
- d. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Testing, Setting and/or Replacing a DC Regulator," slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 221-1, 221-5
- b. Oklahoma, Auto Mechanics II
- c. MAVCC, Diesel Engine Mechanics, F-V

Tools and Equipment:

- a. Hand tools

(Continued on back)

LAB HOURS	6
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CLASS HOURS	3
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EVALUATION

(HD-16)

- a. Given an operational DC charging system and necessary tools and equipment, the learner will test the DC generator and regulator. Test results must be within 5% of known values.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 79, 86.
- d. V'TECS, Diesel Mechanics, Task No. A.03.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Prentice-Hall, "How the Automobile Works," film-strip

Tools and Equipment:

- b. Hydrometer
- c. Volt-ammeter
- d. Dwell tach
- e. Shop repair manual

TASK

HD-17 Testing the alternator and regulator

PERFORMANCE OBJECTIVE

Test the alternator and regulator output.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Comparing alternators and generators
- b. Charging circuits
- c. Alternator system construction
- d. Alternator construction
- e. Regulator construction and types

Provide Demonstration On:

- a. Testing alternator
- b. Testing regulator

Provide Practical Application On:

- a. Testing alternator
- b. Testing regulator

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Dagel, Diesel Engine Repair
- c. Johnson, Automotive Diagnosis and Tune-Up

A/Vs:

- a. Georgia, "Testing Charging System (Conventional Type)," slide set
- b. Ford, "Charging System-Alternator," slide set; transparencies

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 221-6
- b. Ford, Charging System-Alternator, Student Text
- c. Oklahoma, Auto Mechanics II
- d. MAVCC, Diesel Engine Mechanics, F-VI

Tools and Equipment:

(Continued on back)

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(HD-17)

- a. Given an operational alternator charging system and necessary tools and equipment, the learner will test the alternator and regulator. Test results must be within 5% of known values.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Diesel Mechanics, Task No. A.03.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Hand tools
- b. VA tester or equal type tester
- c. Tach
- d. Shop repair manual

TASK

HD-18 Removing, disassembling and inspecting the generator

PERFORMANCE OBJECTIVE

Remove, disassemble and inspect the DC generator parts and components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Generator circuits
- b. Generator operation
- c. Instrumentation
- d. Using the growler

Provide Demonstration On:

- a. Disassembling generator
- b. Testing armature and field coils
- c. Testing commutator
- d. Inspecting bearings and brushes

Provide Practical Application On:

- a. Disassembling generator
- b. Testing armature
- c. Testing field coils
- d. Testing commutator
- e. Inspecting bearings and brushes

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Dagel, Diesel Engine Repair

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics, F-V

Tools and Equipment:

- a. Hand tools
- b. Armature tester
- c. Ohmmeter
- d. Shop repair manual

LAB HOURS	4
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CLASS HOURS	2
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EVALUATION

(HD-18)

Given an operational DC charging system and necessary tools and equipment, the learner will remove, disassemble and inspect the generator according to standards in the auto shop repair manual and manufacturer's specifications.

TASK

HD-19 Rebuilding the generator

PERFORMANCE OBJECTIVE

Overhaul a DC generator.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Generator circuits
- b. Generator operation
- c. Instrumentation

Provide Demonstration On:

- a. Replacing bushings or bearings
- b. Testing armature and field coils
- c. Turning the commutator
- d. Replacing field coils
- e. Replacing brushes

Provide Practical Application On:

- a. Replacing bushings or bearings
- b. Testing armature and field coils
- c. Turning commutator
- d. Replacing field coils
- e. Replacing brushes

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Dagel, Diesel Engine Repair

A/Vs:

Georgia, "Overhauling a DC Generator," slide set;

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 221-2, 3, 4
- b. Oklahoma, Auto Mechanics II
- c. MAVCC, Diesel Engine Mechanics, F-V

Tools and Equipment:

- a. Hand tools

(Continued on back)

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(HD-19)

- a. Given an operational DC generator and necessary tools and equipment, the learner will rebuild the generator according to standards of the auto shop repair manual and manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task No. 87.

INSTRUCTIONAL MATERIALS

A/Vs:

"Turning Armature and Undercutting Mica," slide set;
"Bench Testing a DC Generator," slide set

Tools and Equipment:

- b. Armature tester
- c. Armature lathe
- d. Ohmmeter
- e. Shop repair manual

TASK

HD-20 Removing, disassembling and inspecting the alternator

PERFORMANCE OBJECTIVE

Remove, disassemble and inspect the alternator parts and components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Alternator circuits
- b. Alternator construction
- c. Instrumentation

Provide Demonstration On:

- a. Removing alternator
- b. Disassembling alternator
- c. Testing stator
- d. Testing rotor
- e. Testing diodes
- f. Checking bearings and brushes

Provide Practical Application On:

- a. Removing alternator
- b. Disassembling alternator
- c. Testing stator
- d. Testing rotor
- e. Testing diodes
- f. Checking bearings and brushes

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Johnson, Automotive Diagnosis and Tune-Up
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Overhauling an A-C Generator (Conventional Type GM)," slide set;

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 221-7, 8, 9; 261-4
- b. Ford, Charging System Alternator, Student Text
- c. Oklahoma, Auto Mechanics II
- d. MAVCC, Diesel Engine Mechanics, F-VI

Tools and Equipment:

(Continued on back)

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(HD-20)

- a. Given an inoperative alternator charging system and necessary tools and equipment, the learner will remove, disassemble and inspect the alternator. The problem(s) must be located in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automobile Mechanics, Task No. 87.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Overhauling a Ford Motor Type," slide set; "Overhauling A-C Generator," slide set; "Testing and Rebuilding an Integrated General Motors Type A-C Generator," slide set; "Testing and Rebuilding a Transistorized Ford Type A-C Generator," slide set
- b. Ford, "Charging System Alternator," transparencies

Tools and Equipment:

- a. Hand tools
- b. Ohmmeter
- c. Diode tester
- d. Shop repair manual

TASK

HD-21 Rebuilding the alternator

PERFORMANCE OBJECTIVE

Overhaul alternator, replace defective parts and perform a bench test.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Alternator circuits
- b. Alternator construction
- c. Diode placement
- d. Instrumentation

Provide Demonstration On:

- a. Removing and replacing rotor
- b. Removing and replacing stator
- c. Removing and replacing diodes
- d. Removing and replacing brushes and bearings
- e. Resurfacing slip rings

Provide Practical Application On:

- a. Removing and replacing rotor
- b. Removing and replacing stator

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Dagel, Diesel Engine Repair

A/Vs:

(Continued on back)

Student Manuals:

MAVCC, Diesel Engine Mechanics, F-VI

Tools and Equipment:

- a. Hand tools
- b. Diode press
- c. Bearing press
- d. Shop repair manual

LAB HOURS	6
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CLASS HOURS	2
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EVALUATION

(HD-21)

- a. Given an operational alternator charging system (live or trainer) and necessary tools and equipment, the learner will rebuild the alternator. The alternator output must be within 5% of manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application
On:

- c. Removing and replacing diodes
- d. Removing and replacing brushes and bearings
- e. Resurfacing slip rings

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Overhauling a Ford Motor Type," slide set; "Overhauling A-C Generator," slide set; "Testing and Rebuilding an Integrated General Motors Type A-C Generator," slide set; Testing and Rebuilding a Transistorized Ford Type A-C Generator," slide set
- b. Ford, "Charging System alternator," transparencies

TASK

HD-22 Removing and replacing generators and alternators

PERFORMANCE OBJECTIVE

Remove and replace the generator or alternator.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Generator circuits
- b. Alternator circuits
- c. Hook-ups
- d. Drive belts

Provide Demonstration On:

- a. Polarizing A and B type generators
- b. Installing generator
- c. Installing alternator

Provide Practical Application On:

- a. Removing and installing generator
- b. Polarizing A and B type generator
- c. Removing and installing alternator

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics, F-VI

Tools and Equipment:

- a. Hand tools
- b. Belt tension tool

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(HD-22)

- a. Given an operational charging system (generator or alternator type) and necessary tools and equipment, the learner will remove and replace the generator or alternator according to standards and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 98.

TASK

HD-23 Diagnosing charging system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the charging system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Generator circuits
- b. Alternator circuits
- c. Instrumentation

Provide Demonstration On:

- a. Diagnosing generator problems
- b. Diagnosing alternator problems
- c. Diagnosing regulator problems
- d. Diagnosing wiring problems

Provide Practical Application On:

- a. Diagnosing generator problems
- b. Diagnosing alternator problems
- c. Diagnosing regulator problems
- d. Diagnosing wiring problems

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Dagel, Diesel Engine Repair

A/Vs:

Ford, "Charging System Diagnosis," filmstrip

Student Manuals:

- a. Ford, Charging System Diagnosis, Student Text
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Volt ohmmeter
- c. VA tester or equal tester
- d. Tach
- e. Shop repair manual

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(HD-23)

- a. Given an operational gas engine with faulty charging system and necessary tools and equipment, the learner will develop a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

HD-24 Checking coolant level and freezing point

PERFORMANCE OBJECTIVE

Check and replace coolant.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Cooling system function
- b. Protection of cooling system
- c. Engine coolant
- d. Tester use

Provide Demonstration On:

- a. Checking coolant level in radiator
- b. Checking coolant level in expansion tank
- c. Checking freezing point

Provide Practical Application On:

- a. Checking coolant level in radiator
- b. Checking coolant level in expansion tank
- c. Checking freezing point with approved tester

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Mechanic Fundamentals
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Kates, Diesel and High Compression Gas Engine

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 212-1
- b. Ford, Cooling System Principles of Operation, Student Text
- c. Oklahoma, Auto Mechanics I
- d. MAVCC, Diesel Engine Mechanics, B-IV

Tools and Equipment:

(Continued on back)

LAB HOURS 2

CLASS HOURS 2

EVALUATION

(HD-24)

- a. Given an operational cooling system (live or trainer) and necessary tools and equipment, the learner will check the coolant level and restore freezing point to 34° F.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Diesel Mechanic, Task No. A-04.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Servicing Cooling System," slide set
- b. Bergwall, "The Automotive Cooling System Explained," filmstrip; "How to Service the Cooling System," filmstrip
- c. Ford, "Cooling System Principles of Operation," slide set
- d. Prentice-Hall, "How the Automobile Works," filmstrip

Tools and Equipment:

- a. Hand tools
- b. Anti-freeze tester
- c. Shop repair manual

TASK

HD-25 Cleaning and flushing the system

PERFORMANCE OBJECTIVE

Clean and flush the cooling system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Cooling system construction
- b. Cleaning solutions
- c. Flushing procedures

Provide Demonstration On:

- a. Using cleaning solution
- b. Using flushing equipment
- c. Cleaning system
- d. Flushing system

Provide Practical Application On:

Cleaning and flushing system

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Mechanic: Fundamentals
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Bergwall, "Auto Cooling System Explained," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. MAVCC, Diesel Engine Mechanics, B-IV, D-II

Tools and Equipment:

- a. Hand tools
- b. Cleaning solutions
- c. Flushing solutions
- d. Shop repair manual

LAB HOURS	2
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CLASS HOURS	1
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EVALUATION

(HD-25)

- a. Given an operational cooling system and necessary tools and equipment, the learner will clean and flush the system to standards of the auto shop repair manual.
- b. V'TECS, Automotive Mechanics, Task No. 129.

TASK

HD-26 Inspecting, adjusting or replacing fan belts and hoses

PERFORMANCE OBJECTIVE

Inspect, adjust or replace fan belts and hoses.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Belt construction and use
- b. Hose construction and use

Provide Demonstration On:

- a. Inspecting belts and hoses
- b. Adjusting belts
- c. Replacing belts and hoses

Provide Practical Application On:

Inspecting and replacing water pump drive belts and radiator and heater hoses

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Mechanic Fundamentals
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

- a. Bergwall, "Auto Cooling System Explained," filmstrip
- b. Prentice-Hall, "Working with Hoses," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Belt tension gauge
- c. Shop repair manual

LAB HOURS	6
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CLASS HOURS	2
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EVALUATION

(HD-26)

- a. Given an operational engine and necessary tools and equipment, the learner will inspect, adjust or replace fan belts and hoses. Hose connections must hold 20 psi pressure and no leaks. Belts must be tensioned to within 5% of manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Diesel Mechanic, Task No. A-04.

TASK

HD-27 Testing system with pressure

PERFORMANCE OBJECTIVE

Pressure test cooling system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Cooling system construction
- b. Pressure tester

Provide Demonstration On:

- a. Using pressure tester
- b. Pressure testing cooling system
- c. Pressure testing radiator cap

Provide Practical Application On:

Pressure testing cooling system

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Mechanic Fundamentals
- b. Toboldt and Johnson, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Dagel, Diesel Engine Repair

A/Vs:

Cummins, "There's More to Cooling," 16mm film

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. MAVCC, Diesel Engine Mechanics, B-II

Tools and Equipment:

- a. Hand tools
- b. Pressure tools
- c. Shop repair manual

LAB HOURS	2
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CLASS HOURS	1
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EVALUATION

(HD-27)

- a. Given an operational engine (live or trainer) and necessary tools and equipment, the learner will test cooling system with correct pressure and observe and record any noticeable leaks.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Diesel Mechanic, Task No. A-04.

TASK

HD-28 Removing, repairing and replacing the radiator

PERFORMANCE OBJECTIVE

Remove, repair and replace the radiator.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Radiator construction
- b. Repair procedures
- c. Radiator specialists

Provide Demonstration On:

- a. Removing radiator
- b. Repairing tank leaks
- c. Repairing tube leaks
- d. Checking transmission coder
- e. Replacing radiator

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Dagel, Diesel Engine Repair

A/Vs:

Bergwall, "Auto Cooling System Explained," film-strip

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Soldering torch, flux and solder
- c. Tube rods
- d. Pressure adapter for transmission coder
- e. Shop repair manual

LAB HOURS 8

CLASS HOURS 4

EVALUATION

(HD-28)

- a. Given an operational cooling system (live or trainer) and necessary tools and equipment, the learner will remove, repair and replace the radiator. When pressure tested, the radiator will show no sign of water leakage.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 129, 133, 139.

TASK

HD-29 Testing and replacing thermostats and radiator caps

PERFORMANCE OBJECTIVE

Test and replace thermostats and radiator caps.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Thermostat construction and function
- b. Radiator cap construction and function

Provide Demonstration On:

- a. Testing thermostat
- b. Replacing thermostat
- c. Testing radiator cap
- d. Replacing radiator cap

Provide Practical Application On:

Testing, removing and replacing thermostats and radiator caps

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Dagel, Diesel Engine Repair

A/Vs:

Bergwall, "Auto Cooling System Explained," film-strip

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. MAVCC, Diesel Engine Mechanics, D-II

Tools and Equipment:

- a. Hand tools
- b. Pressure tester
- c. Thermostat
- d. Shop repair manual

LAB HOURS	6
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CLASS HOURS	2
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EVALUATION

(HD-29)

- a. Given an operational cooling system (live or trainer) and necessary tools and equipment, the learner will test and replace the thermostat and radiator cap. Test results must be within 10% of known values.
- b. V'TECS, Automotive Mechanics, Task No. 140, 141.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

HD-30 Replacing the variable speed fan

PERFORMANCE OBJECTIVE

Inspect, remove and replace the variable speed fan.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Variable speed fan construction
- b. Variable speed fan function

Provide Demonstration On:

- a. Checking variable speed fan
- b. Replacing variable speed fan

Provide Practical Application On:

Checking and replacing variable speed fan

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Shop repair manual

A/Vs:

Bergwall, "The Auto Cooling System Explained," filmstrip

LAB HOURS 6

CLASS HOURS 2

III-105

EVALUATION

(HD-30)

- a. Given an operational cooling system and necessary tools and equipment, the learner will inspect, remove and replace the variable speed fan to standards in the auto shop repair manual.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 137.

TASK

HD-31 Replacing the water pump

PERFORMANCE OBJECTIVE

Inspect, remove and replace the water pump.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Water pump construction
- b. Water pump function

Provide Demonstration On:

- a. Checking water pump
- b. Replacing water pump

Provide Practical Application On:

Checking, removing and replacing the water pump

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up
- d. Dagel, Diesel Engine Repair

A/Vs:

Bergwall, "The Auto Cooling System Explained," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. MAVCC, Diesel Engine Mechanics, D-II

Tools and Equipment:

- a. Hand tools
- b. Coolant drain container
- c. Shop repair manual

LAB HOURS 8

CLASS HOURS 2

EVALUATION

(HD-31)

- a. Given an operational cooling system and necessary tools and equipment, the learner will replace the water pump. Upon completion, the pump must turn freely and show no signs of water leakage.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 138.

TASK

HD-32 Repairing the heater controls

PERFORMANCE OBJECTIVE

Inspect and repair the heater controls.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Control construction (manual)
- b. Control construction (automatic)
- c. Control function (manual)
- d. Control function (automatic)

Provide Demonstration On:

- a. Repairing manual heater control
- b. Repairing automatic heater controls

Provide Practical Application On:

Inspecting and repairing manual and automatic heater controls

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-Up

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Test light
- c. Thermometer
- d. Shop repair manual

LAB HOURS 4

CLASS HOURS 1

EVALUATION

(HD-32)

- a. Given an operational cooling system with operational heater system and necessary tools and equipment, the learner will repair the heater controls to operate within manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 225, 228.

TASK

HD-33 Removing, repairing and replacing the heater core

PERFORMANCE OBJECTIVE

Remove, repair and replace the heater core.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Heater core construction
- b. Repair procedures

Provide Demonstration On:

- a. Removing heater core
- b. Repairing heater core
- c. Replacing heater core

Provide Practical Application On:

Removing, repairing and replacing heater core

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-up

A/Vs:

Bergwall, "Auto Cooling System Explained," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Soldering and/or torch, flux and solder
- c. Pressure adapter fuel leak test
- d. Shop repair manual

LAB HOURS	8
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CLASS HOURS	2
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EVALUATION

(HD-33)

- a. Given an operational cooling system with operational heater system and necessary tools and equipment, the learner will remove, repair and replace the heater core. Upon completion, the heater core must show no sign of leakage.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanic, Task Nos. 224, 226, 227.

TASK

HD-34 Diagnosing engine heating and cooling system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the charging system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Cooling system construction
- b. Cooling system function
- c. Cooling system operation
- d. Heater function and operation

Provide Demonstration On:

Diagnosing problems in heating and cooling system

Provide Practical Application On:

Diagnosing problems in cooling and heating systems

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia
- c. Wetzel, Automotive Diagnosis and Tune-up
- d. Dagel, Diesel Engine Repair

A/Vs:

Bergwall, "Auto Cooling System Explained," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Anti-freeze hydrometer
- c. Pressure tester
- d. Tension gauge
- e. Shop repair manual
- f. Thermometer

LAB HOURS 6

CLASS HOURS 3

EVALUATION

(HD-34)

- a. Given an operational engine with inoperative cooling system and necessary tools and equipment, the learner will develop a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Autotive Mechanics, Task No. 223.

TASK

HD-35 Identifying the brake system components

PERFORMANCE OBJECTIVE

Identify the component parts of the drum and disc brake system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Principles of friction
- b. Principles of hydraulics
- c. Brake action
- d. Brake system components
- e. Drum brakes v/s disc brakes
- f. Safe working conditions

Provide Demonstration On:

- a. Friction principles
- b. Hydraulic principles
- c. Various brake system designs
- d. Brake park application

Provide Practical Application On:

Removing wheels and brake drums and identifying brake system components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Remling, Brakes
- c. Stockel, Auto Service and Repair; Auto Mechanic Fundamentals
- d. Toboldt, Automotive Encyclopedia

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 231-1
- b. MAVCC, Braking Systems
- c. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Chassis
- b. Shop manual

(Continued on back)

LAB HOURS 8

CLASS HOURS 4

EVALUATION

(HD-35)

- a. Given a truck chassis with air or hydraulic brakes, the learner will remove the wheels and brake drums and identify the component parts of the drum and disc brake system. Identification must be 100% correct.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Checking Brake System Condition and Operation," slide set
- b. Ford, "Evolution of Brakes," filmstrip
- c. Bergwall, "Automatic Brakes Explained," film-strip

Tools and Equipment:

- c. Assorted brake tools
- d. Assorted hand tools

TASK

HD-36 Adjusting brakes

PERFORMANCE OBJECTIVE

Adjust brakes to specifications.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of adjustments
- b. Self-adjusting brakes
- c. Brake adjustment tools
- d. Jack or lift safety
- e. Using jack stands

Provide Demonstration On:

- a. Pre-adjusting of self-adjusting brakes
- b. Adjusting regular brakes

Provide Practical Application On:

- a. Raising vehicle in preparation of brake adjustment
- b. Adjusting brakes

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Mechanics; Auto Service and Repair
- b. Toboldt, Automotive Encyclopedia

A/Vs:

- a. Georgia, "Checking Brake System Condition and Operation," slide set
- b. Bergwall, "Automatic Brakes Explained," film-strip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 231-1
- b. MAVCC, Braking Systems
- c. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Chassis with drum brakes
- b. Shop manual
- c. Brake adjusting pool
- d. Brake adjusting gauge

LAB HOURS	4
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CLASS HOURS	1
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III-117

EVALUATION

(HD-36)

- a. Given a vehicle, the learner will raise vehicle in a safe manner, place it on safety stands and adjust brakes to manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS Automotive Mechanics, Task Nos. 160-162.

TASK

HD-37 Removing and rebuilding brake cylinders

PERFORMANCE OBJECTIVE

Inspect and rebuild master and wheel cylinders.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Master and wheel cylinder components
- b. Basic component removal procedures
- c. Cylinder honing and inspection
- d. Brake bleeding
- e. Single and dual master cylinder
- f. Brake lines

Provide Demonstration On:

- a. Cylinder removal
- b. Cylinder honing
- c. Cylinder inspection
- d. Brake bleeding
- e. Reassembly procedures

Provide Practical Application On:

- a. Removing a master cylinder, disassembling, inspecting, identifying parts and rebuilding
- b. Removing a wheel cylinder, disassembling, inspecting, identifying parts and rebuilding

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Remling, Brakes
- c. Stockel, Auto Mechanic Fundamentals; Auto Service and Repair
- d. Toboldt, Automotive Encyclopedia

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 231-2, 231-4, 231-9
- b. MAVCC, Braking Systems
- c. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Automotive chassis with drum brakes

(Continued on back)

LAB HOURS 10

CLASS HOURS 2

EVALUATION

(HD-37)

- a. Given a vehicle, the learner will remove a master and a wheel cylinder, disassemble, hone, inspect, and reassemble it with new parts and bleed system. The system must be free of air and leaks.
- b. V'TECS, Automotive Mechanics, Task Nos. 163, 187, 190, 196, 187.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Overhauling Master Cylinder," slide set; "Overhauling and/or Replacing Wheel Cylinders," slide set; "Bleeding Brake System," slide set
- b. Bergwall, "Automatic Brakes Explained," film-strip

Tools and Equipment:

- b. Shop manual
- c. Assorted hand tools
- d. Brake cylinder hone
- e. Brake cylinder parts kit (master or wheel)
- f. Brake bleeder kit
- g. Electric drill

TASK

HD-38 Removing and rebuilding brake calipers

PERFORMANCE OBJECTIVE

Inspect and rebuild disc brake calipers.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Caliper types and applications
- b. Caliper removal procedures
- c. Caliper disassembly and inspection
- d. Caliper reassembly and installation
- f. Brake bleeding
- g. Torque specifications

Provide Demonstration On:

- a. Caliper removal
- b. Honing and inspection
- c. Reassembly procedures
- d. Brake pad installation
- e. Torquing caliper bolts

Provide Practical Application On:

Removing and rebuilding brake calipers

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Remling, Brakes
- c. Stockel, Auto Mechanic Fundamentals; Auto Service and Repair
- d. Toboldt, Automotive Encyclopedia

A/Vs:

Bergwall, "Automotive Brakes Explained," filmstrip

Student Manuals:

- a. MAVCC, Braking Systems
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Chassis with disc brakes
- b. Shop manual
- c. Assorted hand tools
- d. Brake caliper tool
- e. Brake hone

(Continued on back)

LAB HOURS 8

CLASS HOURS 2

EVALUATION

(HD-38)

- a. Given a vehicle with disc brakes, the learner will remove, disassemble, hone and inspect a caliper assembly. The learner will reassemble the caliper with new parts and bleed system. The system must be free of air and leaks.
- b. V'TECS, Automotive Mechanics, Task Nos. 177, 186.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- f. Electric drill
- g. Parts kit (caliper)
- h. Brake bleeder kit
- i. Torque wrench
- j. Brake caliper removal tool

TASK

HD-39 Replacing brake shoes and pads

PERFORMANCE OBJECTIVE

Inspect, remove and replace brake shoes and disc pads.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Drum brake component parts from the rear wheels
- b. Types of linings
- c. Brake springs
- d. Self-adjusting brake types
- e. Initial adjustment
- f. Disc brake pad replacement
- g. Servicing front wheel bearings

Provide Demonstration On:

- a. Shoe replacement procedures
- b. Disc brake pad replacement procedures
- c. Initial adjustments
- d. Repacking front wheel bearings

Provide Practical Application On:

- a. Removing and replacing brake shoes
- b. Removing and replacing disc brake pads

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Remling, Brakes
- c. Stockel, Auto Mechanic Fundamentals; Auto Service and Repair
- d. Toboldt, Automotive Encyclopedia

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 231-6, 231-7, 231-12
- b. MAVCC, Braking Systems
- c. Oklahoma, Auto Mechanics I

Tools and Equipment:

(Continued on back)

LAB HOURS	8
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CLASS HOURS	1
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EVALUATION

(HD-39)

- a. Given a vehicle with drum and disc brakes, the learner will remove the shoes and pads and replace them. The braking action must be smooth, noiseless and not pull to left or right.
- b. V'TECS, Automotive Mechanics, Task Nos. 173, 179, 182, 183.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, Cam Grinding Brake Shoe," slide set; "Replacing Brake Shoes," slide set; "Replacing Front Disc Pads," slide set
- b. Bergwall, "Automotive Brakes Explained," film-strip

Tools and Equipment:

- a. Chassis drum or disc brakes
- b. Shop manual
- c. Assorted hand tools
- d. Assorted brake tools
- e. Replacement shoes or pads
- f. Torque wrench

TASK

HD-40 Machine brake drums

PERFORMANCE OBJECTIVE

Machine a brake drum.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Safety
- b. Types of drums and adapters
- c. Drum inspection (defects)
- d. Drum mounting on lathe
- e. Measuring drums
- f. Drum grinding

Provide Demonstration On:

- a. Maching operation
- b. Drum mounting procedure
- c. Type of cuts
- d. Use of micrometer
- e. Grinding operation

Provide Practical Application On:

Machining both front and rear brake drums

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Remling, Brakes
- b. Toboldt, Automotive Encyclopedia

A/Vs:

- a. Georgia, "Turning Brake Chain," slide set
- b. Bergwall, "Automotive Brakes Explained," film-strip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 231-5
- b. MAVCC, Braking Systems
- c. Oklahoma, Auto Mechanics I

Tools and Equipment:

(Continued on back)

LAB HOURS 6

CLASS HOURS 1

EVALUATION

(HD-40)

- a. Given front and rear brake drums, the learner will machine drums. The drums must be smooth and within manufacturer's limits.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Front and rear brake drums
- b. Brake drum machine
- c. Brake drum micrometer

TASK

HD-41 Machining brake rotors

PERFORMANCE OBJECTIVE

Machine a disc brake rotor and make a determination if it is within limits of the manufacturer's specifications.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of rotors and adapters
- b. Mounting rotor on lathe
- c. Machining limits
- d. Rotor thickness and variation

Provide Demonstration On:

- a. Machine operation
- b. Rotor mounting procedure
- c. Identifying limits
- d. Grinding operation
- e. Measuring rotor

Provide Practical Application On:

Machining a disc brake rotor

INSTRUCTIONAL MATERIALS

Textbooks:

Remling, Brakes

A/Vs:

Bergwall, "Automotive Brakes Explained," filmstrip

Student Manuals:

- a. MAVCC, Braking Systems
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Disc brake rotor
- b. Disc brake machine
- c. Micrometer

LAB HOURS 6

CLASS HOURS 1

EVALUATION

(HD-41)

- a. Given a disc brake rotor, the learner will machine the rotor. The rotor must be smooth and within manufacturer's limits.
- b. V'TECS, Automotive Mechanics, Task No. 166.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

HD-42 Replacing hydraulic and/or air control valves and lines

PERFORMANCE OBJECTIVE

Replace hydraulic and/or air control valves and lines.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of control valves
- b. Control valve application
- c. Identifying valve function and location
- d. Types of special tools needed
- e. Lines and hoses

Provide Demonstration On:

- a. Valve replacement procedure
- b. Valve identification
- c. Valve location
- d. Flaring metal lines

Provide Practical Application On:

Replacing a hydraulic or air control valve, line and a flexible hose

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Fundamentals
- b. Remling, Brakes

A/Vs:

Georgia, "Cutting and Flaring Tubing," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 102-4
- b. MAVCC, Braking Systems
- c. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Chassis
- b. Shop manual

(Continued on back)

LAB HOURS	10
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CLASS HOURS	2
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EVALUATION

(HD-42)

- a. Given a vehicle equipped with a hydraulic control valve and lines, the learner will remove and replace the valve and the steel lines. The system must operate without leaks.
- b. V'TECS, Automotive Mechanics, Task Nos. 177, 193.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- c. Assorted hand tools
- d. Line wrench set
- e. Double flaring tool set

TASK

HD-43 Replacing power brake units

PERFORMANCE OBJECTIVE

Replace a power brake unit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of power brake units
- b. Power booster operation
- c. Power booster application
- d. Booster failure diagnosis
- e. Booster component part identification

Provide Demonstration On:

- a. Replacement procedures
- b. Diagnosis procedures

Provide Practical Application On:

Replacing a power booster unit

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Remling, Brakes

A/Vs:

- a. Bergwall, "Automotive Brakes Explained," filmstrip
- b. GM(Olds), "Power Brakes," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 231-13
- b. MAVCC, Braking Systems
- c. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Vehicle
- b. Shop manual

(Continued on back)

LAB HOURS

6

CLASS HOURS

2

EVALUATION

(HD-43)

- a. Given a vehicle with a power brake unit, the learner will diagnose, remove and replace the unit. Brake pedal action must be easy with no leaks or air in the system.
- b. V'TECS, Automotive Mechanics, Task Nos. 180, 181.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- c. Assorted hand tools
- d. Line wrench set

TASK

HD-44 Diagnosing brake system problems

PERFORMANCE OBJECTIVE

Develop a diagnostic plan for locating problems in the brake system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Safety
- b. Diagnosis procedures
- c. Inspection procedures
- d. Chassis components and their relationship

Provide Demonstration On:

- a. Inspection procedures
- b. Diagnosis procedures

Provide Practical Application On:

Inspecting and diagnosing a known problem on a vehicle using a troubleshooting plan

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Fundamentals
- b. Remling, Brakes

A/Vs:

- a. Georgia, "Checking brake system condition and operation," slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 231-1
- b. Ford, Diagnosis of Hydraulic Brakes, Student Text; Drum and Disc Brakes, Student Text
- d. MAVCC, Braking Systems
- e. Oklahoma, Auto Mechanics I

Tools and Equipment:

(Continued on back)

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(HD-44)

- a. Given a vehicle with a faulty brake system, the learner will describe a troubleshooting plan and locate the problem and cause. The plan must lead the learner to the cause of the problem within established flat rate time.
- b. V'TECS, Automotive Mechanics, Task No. 169.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Ford, "Drum and Disc Brakes," slide set
- c. Bergwall, "Automotive Brakes Explained," film-strip

Tools and Equipment:

- a. Vehicle
- b. Shop manual
- c. Assorted hand tools
- d. Shop equipment to raise vehicle

TASK

HD-45 Locating and identifying suspension system components

PERFORMANCE OBJECTIVE

Locate and identify suspension system components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. The frame
- b. Front suspension systems
- c. Rear suspension systems
- d. Springs and shock absorbers
- e. Wheels and tires

Provide Demonstration On:

- a. Identifying frame
- b. Identifying front suspension components
- c. Identifying rear suspension components
- d. Identifying springs and shock absorbers
- e. Identifying wheels and tires

Provide Practical Application On:

- a. Identifying frame
- b. Identifying front suspension components

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Hoist or other lifting device
- c. Parts catalog
- d. Shop repair manual

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(HD-45)

- a. Given an operational suspension system and necessary tools and equipment, the learner will identify and label suspension components. All identification must be 100% correct.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application
On:

- c. Identifying rear suspension components
- d. Identifying springs and shock absorbers
- e. Identifying wheels and tires

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Bergwall, "The Front End Explained," filmstrip
- b. Prentice-Hall, "How the Automobile Works," filmstrip
- c. Ford, "Front and Rear Suspension Systems," slide set

TASK

HD-46 Inspecting suspension system components

PERFORMANCE OBJECTIVE

Inspect and evaluate suspension system components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. The frame
- b. Front suspension
- c. Rear suspension
- d. Springs and shock absorbers
- e. Wheels and tires

Provide Demonstration On:

- a. Inspecting the frame
- b. Inspecting front suspension
- c. Inspecting rear suspension
- d. Inspecting springs and shock absorbers
- e. Inspecting wheels and tires

Provide Practical Application On:

- a. Inspecting and evaluating the frame
- b. Inspecting and evaluating front suspension components

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 232-1
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Hoist or other lifting device
- c. Shop repair manual

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(HD-46)

- a. Given an operational suspension system and necessary tools and equipment, the learner will inspect suspension system components. Unsafe conditions must be identified with 100% accuracy.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 196.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application On:

- c. Inspecting and evaluating rear suspension components
- d. Inspecting and evaluating springs and shock absorbers
- e. Inspecting and evaluating wheels and tires

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Inspecting Steering Linkage and Suspension," slide set
- b. Bergwall, "The Front End Explained," filmstrip

TASK

HD-47 Lubricating and adjusting front wheel bearings

PERFORMANCE OBJECTIVE

Inspect, lubricate and adjust front wheel bearings.

INSTRUCTIONAL ACTIVITIES

Provide Information for:

- a. Lubricants
- b. Bearing types
- c. Drum brake hubs
- d. Disc brake hubs

Provide Demonstration On:

- a. Inspecting and lubricating bearings
- b. Adjusting front wheel bearings

Provide Practical Application On:

Removing, inspecting, lubricating and reinstalling front wheel bearings

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 232-9
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Lubricant
- c. Torque wrench

(Continued on back)

LAB HOURS 4

CLASS HOURS 1

EVALUATION (HD-47)

- a. Given an operational suspension system and necessary tools and equipment, the learner will lubricate and adjust front wheel bearings. All work must meet manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vol. II
- d. V'TECS, Automotive Mechanics, Task Nos. 188, 189, 200.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Bergwall, "The Front End Explained," filmstrip
- b. Prentice-Hall, "Steering and Suspension Systems," filmstrip

Tools and Equipment:

- d. Bearing packing tools
- e. Shop repair manual

TASK

HD-48 Replacing shock absorbers

PERFORMANCE OBJECTIVE

Remove and replace shock absorbers.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Shock absorber construction
- b. Shock absorber function

Provide Demonstration On:

- a. Checking shock absorbers
- b. Replacing shock absorbers

Provide Practical Application On:

Removing and replacing shock absorbers

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Shop repair manual
- c. Hoist or other lifting device
- d. Shock absorbers

LAB HOURS	6
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CLASS HOURS	2
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EVALUATION

(HD-48)

- a. Given an operational suspension system and necessary tools and equipment, the learner will remove and replace shock absorbers according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 203.

INSTRUCTIONAL MATERIALS

A/Vs:

Bergwall, "Front End
Explained," filmstrip

TASK

HD-49 Replacing front coil springs and rear leaf springs

PERFORMANCE OBJECTIVE

Inspect and replace coil springs and rear leaf springs.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Coil spring construction
- b. Leaf spring construction
- c. Coil and leaf spring construction
- d. Coil spring compressor
- e. Safety

Provide Demonstration On:

- a. Replacing front coil springs
- b. Replacing rear leaf springs

Provide Practical Application On:

- a. Replacing front coil springs
- b. Replacing rear leaf springs

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

A/Vs:

Georgia, "Replacing Upper Control Arm Mounted Coil Springs", slide set

Student Manuals:

Georgia, Auto Mechanics, Units 232-12, 232-13

Tools and Equipment:

- a. Hand tools
- b. Coil spring compressor
- c. Hoist or other lifting device
- d. Shop repair manual

LAB HOURS 12

CLASS HOURS 2

EVALUATION

(HD-49)

- a. Given an operational suspension system and necessary tools and equipment, the learner will replace front coil springs and rear leaf springs according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

TASK

HD-50 Changing and balancing wheels and tires

PERFORMANCE OBJECTIVE

Repair, change and balance wheels and tires.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Wheel and tire construction and functions
- b. Balancing principles

Provide Demonstration On:

- a. Changing tires and wheels
- b. Static balancing tires
- c. Dynamic balancing tires
- d. Tire repair

Provide Practical Application On:

- a. Changing tires and wheels
- b. Static balance tires
- c. Dynamic balance tires
- d. Repairing tires and wheels

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 232-7, 232-8, 232-10
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Tire changer
- c. Static balancer

(Continued on back)

LAB HOURS	8
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CLASS HOURS	2
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EVALUATION

(HD-50)

- a. Given an operational suspension system and necessary tools and equipment, the learner will change, repair and balance wheels and tires. The tire will have no air leaks and must show no signs of "out of balance" when road tested.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vol. II.
- d. V'TECS, Automotive Mechanics, Task No. 190.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Balancing Front Wheels," slide set; "Balancing Rear Wheels," slide set; "Truing Tires," slide set
- b. Ford, "Tire Problem Analysis," filmstrip
- c. Prentice-Hall, "Basic Automotive Service," filmstrip; "Wheel Balancing," filmstrip

Tools and Equipment:

- d. Dynamic balancer
- e. Shop repair manual

TASK

HD-51 Replacing upper and lower control arms and bushings

PERFORMANCE OBJECTIVE

Inspect, remove and replace upper and lower control arms and bushings.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- Control arm construction
- Control arm function
- Control arm bushing
- Safety

Provide Demonstration On:

- Inspecting assemblies
- Replacing upper control arm
- Replacing upper control arm busing
- Replacing lower control arm
- Replacing lower control arm bushing

Provide Practical Application On:

Replacing upper and lower control arm bushings on one side of vehicle

INSTRUCTIONAL MATERIALS

Textbooks:

- Bacon, Principles of Wheel Alignment Service
- Billiet, Automotive Suspension, Steering, Alignment and Brakes
- Crouse, Automotive Mechanics
- Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

- Georgia, Auto Mechanics, Unit 232-15
- Oklahoma, Auto Mechanics I

Tools and Equipment:

- Hand tools
- Coil spring compressor

(Continued on back)

LAB HOURS	8
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CLASS HOURS	2
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EVALUATION

(HD-51)

- a. Given an operational suspension system and necessary tools and equipment, the learner will safely replace upper and lower control arms and brushings according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 201.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Replacing Ball Joints and Control Arm Brushups," slide set
- b. Bergwall, "The Front End Explained," filmstrip

Tools and Equipment:

- c. Brushing removal installer tools
- d. Control arm
- e. Shop repair manual

TASK

HD-52 Replacing upper and lower ball joints

PERFORMANCE OBJECTIVE

Inspect, remove and replace upper and lower ball joints.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Ball joint construction
- b. Ball joint function
- c. Safety

Provide Demonstration On:

- a. Inspecting ball joints
- b. Replacing upper ball joints
- c. Replacing lower ball joints

Provide Practical Application On:

Replacing upper and lower ball joints

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 232-15
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Coil spring compressor

(Continued on back)

LAB HOURS 8

CLASS HOURS 2

EVALUATION

(HD-52)

- a. Given an operational suspension system and necessary tools and equipment, the learner will inspect and safely replace upper and lower ball joints according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 199.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Replacing Ball Joints and Control Arm Breakups," slide set
- b. Bergwall, "The Front End Explained," filmstrip
- c. Prentice-Hall, "Steering and Suspension Systems," filmstrip

Tools and Equipment:

- c. Ball joint separator
- d. Ball joint kit
- e. Shop repair manual

TASK

HD-53 Replacing king pins and bushings

PERFORMANCE OBJECTIVE

Inspect, remove and replace king pins and bushings.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. King pin construction
- b. King pin function
- c. Bushing construction
- d. Bushing function

Provide Demonstration On:

- a. Replacing king pins
- b. Replacing bushings

Provide Practical Application On:

Inspecting, removing and replacing king pins and bushings

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics

Tools and Equipment:

- a. Hand tools
- b. Tie rod end separator
- c. Bushing tools
- d. King pin set
- e. Shop repair manual

LAB HOURS 10

CLASS HOURS 2

EVALUATION

(HD-53)

- a. Given an operational king pin type suspension system and necessary tools and equipment, the learner will replace king pins and bushings according to standards of auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 197.

TASK

HD-54 Replacing torsion bars

PERFORMANCE OBJECTIVE

Inspect, remove and replace torsion bars.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Torsion bar construction
- b. Torsion bar function
- c. Safety

Provide Demonstration On:

- a. Inspecting torsion bars
- b. Replacing torsion bars

Provide Practical Application On:

Removing and replacing a torsion bar

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

Student Manuals:

Georgia, Auto Mechanics, Unit 232-II

Tools and Equipment:

- a. Hand tools
- b. Tie rod end separator
- c. Shop repair manual
- e. Torsion bar

A/Vs:

(Continued on back)

LAB HOURS

CLASS HOURS

EVALUATION (HD-54)

- a. Given an operational suspension system and necessary tools and equipment, the learner will inspect, remove and replace torsion bars according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 186.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Replacing and Adjusting Torsion Bars, Replacing Shocks," film-loop
- d. Prentice-Hall, "Steering and Suspension Systems," filmstrip

TASK

HD-55 Replacing twin I-beams

PERFORMANCE OBJECTIVE

Inspect, remove and replace twin I-beams.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. I-beam construction
- b. I-beam function

Provide Demonstration On:

Replacing twin I-beams

Provide Practical Application On:

Replacing twin I-beams in a small truck

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- c. Crouse, Automotive Mechanics

A/Vs:

Ford, "Twin I-Beam Front Suspension," filmstrip

Student Manuals:

Ford, Twin I-Beam Front Suspension, Student Text

Tools and Equipment:

- a. Hand tools
- b. Ball joint separator
- c. Tie rod end separator
- d. I-beam component
- e. Auto shop repair manual

LAB HOURS 10

CLASS HOURS 2

EVALUATION

(HD-55)

- a. Given a truck twin I-beam suspension system and necessary tools and equipment, the learner will replace twin I-beams according to standards of the auto shop repair manual and manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

TASK

HD-56 Diagnosing suspension system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the suspension system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Suspension system construction
- b. Suspension system function

Provide Demonstration On:

Diagnosing suspension system problems

Provide Practical Application On:

Diagnosing suspension system problems

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Bacon, Principles of Wheel Alignment Service
- b. Billiet, Automotive Suspension
- c. Crouse, Automotive Mechanics
- d. Remling, Steering and Suspension

A/Vs:

Georgia, "Troubleshooting Suspension and Handling Problems," filmstrip

Student Manuals:

Georgia, Auto Mechanics, Unit 282-6

Tools and Equipment:

- a. Hand tools
- b. Specifications
- c. Shop repair manual

LAB HOURS 4

CLASS HOURS 4

III-157

EVALUATION

(HD-56)

- a. Given a truck with defective suspension system and necessary tools and equipment, the learner will develop a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 196.

TASK

HD-57 Identifying steering system components

PERFORMANCE OBJECTIVE

Identify the component parts of the steering system and steering gears.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Steering system components
- b. Steering system design
- c. Types of steering systems
- d. Steering gear components
- e. Types of steering gears

Provide Demonstration On:

- a. Steering system inspection
- b. Steering diagnosis procedure

Provide Practical Application On:

Raising a vehicle on lift or jack stands and identifying components of the steering system

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Billiet, Automotive Suspensions, Steering, Alignment and Brakes
- b. Crouse, The Auto Book
- c. Dwiggins, Automotive Steering Systems
- d. Remling, Steering and Suspension

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Chassis
- b. Shop manual

A/Vs:

Bergwall, "The Front End Explained," filmstrip

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(HD-57)

- a. Given a vehicle, the learner will identify the component parts of the steering system with 100% accuracy.
- b. Georgia Student Assessment, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

HD-58 Adjusting manual steering gear

PERFORMANCE OBJECTIVE

Make all necessary steering gear adjustments.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Manual (recirculating ball and nut) gear components
- b. Adjustment procedure
- c. Preload adjustment
- d. Rack and pinion components

Provide Demonstration On:

- a. Adjusting standard type
- b. Adjusting rack and pinion type

Provide Practical Application On:

Adjusting a manual steering gear on a unit provided

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- b. Crouse, The Auto Book
- c. Dwiggins, Automotive Steering Systems
- d. Remling, Steering and Suspension

A/Vs:

Georgia, "Adjusting Steering Gear," slide set 233-1

Student Manual:

- a. Georgia, Auto Mechanics, Unit 233-I
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Chassis with manual steering

(Continued on back)

LAB HOURS 3

CLASS HOURS 1

EVALUATION

(HD-58)

- a. Given a vehicle with maladjusted manual steering, the learner will make the necessary adjustments according to manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 142, 143.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- b. Shop manual
- c. Assorted hand tools
- d. Inch pound torque wrench
- e. Spanner wrench
- f. Floor jack or lift

TASK

HD-59 Inspecting, lubricating and replacing steering gear linkage

PERFORMANCE OBJECTIVE

Inspect, lubricate, remove and replace component parts of the steering linkage.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Steering linkage components
- b. Steering linkage arrangement
- c. Safety
- d. Bushing types
- e. Steering component lubrication
- f. Lubricants

Provide Demonstration On:

- a. Repair procedures
- b. Steering arrangements
- c. Types of bushing
- d. Lubrication procedures

Provide Practical Application On:

Removing and replacing component parts of the steering system

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Billiet, Automotive Suspension, Steering, Alignment and Brakes
- b. Crouse, The Auto Book
- c. Dwiggin, Automotive Steering Systems
- d. Remling, Steering and Suspension

A/Vs:

(Continued on back)

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. Georgia, Auto Mechanics, Unit 232-14

Tools and Equipment:

- a. Chassis
- b. Shop manual
- c. Assorted hand tools
- d. Special suspension tools
- e. Lubrication gun

LAB HOURS 8

CLASS HOURS 2

EVALUATION

(HD-59)

- a. Given a vehicle, the learner will remove and replace steering linkage components according to manufacturer's specifications
- b. V'TECS, Automotive Mechanics, Task Nos. 147, 158, 159, 160, 161, 167, 168, 192, 193.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Replacing Steering Linkage," slide set
- b. Bergwall, "Lubrication Services," filmstrip

TASK

HD-60 Replacing power steering unit

PERFORMANCE OBJECTIVE

Inspect, remove and replace a power steering unit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of steering units
- b. Types of power steering pumps
- c. Power steering components
- d. Centering steering wheel
- e. Steering system adaptation
- f. Safety

Provide Demonstration On:

- a. Removal and replacement procedures
- b. Steering system adaptation

Provide Practical Application On:

Removing and replacing a power steering unit

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dwiggin, Automotive Steering Systems
- b. Remling, Steering and Suspension

A/Vs:

- a. Ford, "Car Power Steering," transparencies
- b. Georgia, "Overhauling a Saginaw Rotary Valve Power Steering Gear," slide set

(Continued on back)

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. Georgia, Auto Mechanics, Units 283-1, 283-2, 283-3, 283-4, 283-5, 283-6

Tools and Equipment:

- a. Chassis
- b. Shop manual
- c. Assorted hand tools
- d. Special pullers

LAB HOURS 10

CLASS HOURS 4

EVALUATION (HD-60)

- a. Given a vehicle with power steering, the learner will remove and replace the power steering unit. The steering must perform to manufacturer's specifications with no leaks.
- b. V'TECS, Automotive Mechanics, Task Nos. 148, 149, 150, 155, 156, 157, 158
- c. Georgia Student Assessment System, Domain Referenced Tests; Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

"Overhauling Late Model
Ford Power Steering Power,"
slide set' "Overhauling
Late Model Chrysler Power
Steering Gear," filmstrip

TASK

HD-61 Replacing steering column

PERFORMANCE OBJECTIVE

Remove and replace a steering column.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of steering columns
- b. Steering column service precautions
- c. Using steering wheel pullers
- d. Steering couplings

Provide Demonstration On:

- a. Disconnecting and re-locating wiring
- b. Pulling steering wheels

Provide Practical Application On:

Replacing a steering column

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, The Auto Book
- b. Dwiggin, Automotive Steering Systems
- c. Remling, Steering and Suspension

A/Vs:

Georgia, "Reconditioning Energy Absorbing Steering Columns," slide set

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. Georgia, Auto Mechanics, Unit 233-4

Tools and Equipment:

- a. Vehicle
- b. Shop manual
- c. Assorted hand tools
- d. Steering wheel puller

LAB HOURS 8

CLASS HOURS 1

EVALUATION

(HD-61)

- a. Given a vehicle, the learner will remove and replace the steering column assembly according to manufacturer's minimum specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 151, 152.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

HD-62 Aligning the front-end

PERFORMANCE OBJECTIVE

Make all necessary adjustments to restore front-end geometry.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Prealignment inspection
- b. Wheel alignment fundamentals
- c. Alignment procedures
- d. Front suspension designs
- e. Front-end alignment equipment

Provide Demonstration On:

- a. Front suspension inspection
- b. Alignment procedures
- c. Use of the different types of equipment

Provide Practical Application On:

- a. Performing prealignment inspection
- b. Aligning a front-end

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, The Auto Book
- b. Dwiggin, Automotive Steering Systems
- c. Remling, Steering and Suspension

A/Vs:

- a. Bergwall, "The Front End Explained," filmstrip;
- "Light Beam Alignment," filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 232-4, 232-5, 232-6
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Vehicle
- b. Shop manual
- c. Front end equipment
- d. Assorted hand tools
- e. Special alignment equipment

LAB HOURS 10

CLASS HOURS 3

EVALUATION

(HD-62)

- a. Given a vehicle, the learner will inspect the system for wear and align front end to meet manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task No. 191.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Georgia, "Setting Coaster," filmloop; "Setting Camber," filmloop; "Setting Toe-in and Straight Ahead," filmloop; "Inspecting and Aligning Front End," filmstrip

TASK

HD-63 Diagnosing steering system problems

PERFORMANCE OBJECTIVE

Formulate a plan for diagnosing problems in the steering system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of suspension systems
- b. Suspension designs
- c. Diagnosis procedures
- d. Use of special equipment

Provide Demonstration On:

- a. Suspension designs
- b. Diagnosis procedures
- c. Special tools needed

Provide Practical Application On:

Placing a vehicle on a lift or jack stand, using the troubleshooting plan to make an inspection to determine conditions

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, The Auto Book
- b. Dwiggins, Automotive Steering Systems
- c. Remling, Steering and Suspension

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. Georgia, Auto Mechanics, Unit 282-6

Tools and Equipment:

- a. Vehicle
- b. Lift or jack
- c. Shop manual
- d. Assorted hand tools

A/Vs:

- a. Georgia, "Troubleshooting Suspension and Handling Problems," filmstrip
- b. Bergwall, "The Front End Explained," filmstrip

LAB HOURS	4
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CLASS HOURS	3
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EVALUATION

(HD-63)

- a. Given a vehicle with a faulty steering system, the learner will place the vehicle on a lift or jack stand. Using a troubleshooting plan, the learner will determine the condition of the suspension system.
- b. V'TECS, Automotive Mechanics, Task No. 146.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

HD-64 Identifying emissions control components

PERFORMANCE OBJECTIVE

Identify and describe the function of emissions control components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Emission control construction
- b. Emission control function
- c. Emission control purpose
- d. Emission control types

Provide Demonstration On:

Identifying and describing emission control components

Provide Practical Application On:

- a. Identifying and locating emissions control components
- b. Providing written or oral description of the function of components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Service and Repair

A/Vs:

- a. Prentice-Hall, "Servicing Ford and General Motors Emission Control Systems," filmstrips

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-11
- b. MAVCC, Automotive Emission Control
- c. Ford, Emission Control Systems, Student Text

Tools and Equipment:

- a. Hand tools

(Continued on back)

LAB HOURS	2
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CLASS HOURS	2
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EVALUATION

(HD-64)

- a. Given an operational engine and necessary tools and equipment, the learner will identify and describe the function of emissions control components. This must be done with 70% accuracy.
- b. MAVCC, Automotive Emission Control.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Ford, "Emission Control Systems," slide set
- c. Bergwall, "Automotive Pollution Control," filmstrip

Tools and Equipment:

- b. Shop repair manual
- c. Various emission components

TASK

HD-65 Removing and replacing exhaust pipes, mufflers and tail pipes

PERFORMANCE OBJECTIVE

Remove and replace exhaust pipes, mufflers and tail pipes.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Exhaust and tail pipe construction
- b. Muffler construction
- c. Exhaust and tail pipe function
- d. Muffler function

Provide Demonstration On:

- a. Removing and replacing exhaust pipes
- b. Removing and replacing tail pipes
- c. Removing and replacing mufflers

Provide Practical Application On:

- a. Removing and replacing the exhaust pipe
- b. Removing and replacing the muffler

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Remling, Basics

A/Vs:

- a. Georgia, "Servicing Exhaust System," slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 213-9
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Exhaust system special tools kit

(Continued on back)

LAB HOURS 10

CLASS HOURS 2

EVALUATION

(HD-65)

- a. Given an operational engine and necessary tools and equipment, the learner will remove and replace the exhaust pipe(s), muffler(s) and tail pipe(s). Upon completion, all fittings must be tight and leakproof. All work must conform to manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 23, 27.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Bergwall, "The Internal Combustion Engine," film-strip

Tools and Equipment:

- c. Muffler cut-a-way
- d. Shop repair manual

TASK

HD-66 Diagnosing emissions control and exhaust system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for determining causes of excessive emissions.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Emissions control construction and functions
- b. Exhaust system construction and functions

Provide Demonstration On:

- a. Diagnosing emissions control problems
- b. Diagnosing exhaust and fuel system emission problems

Provide Practical Application On:

- a. Diagnosing emissions control problems
- b. Diagnosing exhaust and fuel system emissions problems

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

- a. Georgia, "Performing Tests and Servicing Emissions Controls," slide set/film-strip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 223-13
- b. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools
- b. Diagnostic charts from textbooks
- c. Emissions analyzer

LAB HOURS 4

CLASS HOURS 3

EVALUATION

(HD-66)

- a. Given an operational engine with excessive emissions and necessary tools and equipment, the learner will develop a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to Automobile Mechanics Certification Exam.
- c. MAVCC, Automotive Emission Control.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- e. V'TECS, Auto Mechanics, Task Nos. 20, 120, 121.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Bergwall, "Automotive Pollution Control," filmstrip; "Infrared Exhaust Analyzer," filmstrip
- c. Prentice-Hall, "Servicing Ford and General Motors Emission Control Systems," filmstrip

TASK

AC-01 Replacing wiring and making splices

PERFORMANCE OBJECTIVE

Replace wiring and make splices.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Wire gauges
- b. Conductive of different types of wires
- c. Types of solder
- d. Types of splices
- f. Solder irons
- g. Solderless connections
- h. Reading wiring diagrams

Provide Demonstration On:

- a. Splicing techniques
- b. Use of soldering iron
- c. Electrical tape use
- d. Wiring solderless connectors
- e. Reading a wiring diagram

Provide Practical Application On:

- a. Splicing wires
- b. Soldering wires
- c. Replacing repaired wires
- d. Making solderless connections
- e. Locating wires by using a wiring diagram

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Remling, Basics
- c. Stockel, Auto Service and Repair

A/Vs:

- a. Georgia, "Replacing Wire Ends and Splicing Conductors," slide set
- b. Ford, "Electrical Systems...", slide set
- c. Prentice-Hall, "Electric Wiring Procedures," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 201-2
- b. Oklahoma, Auto Mechanics II
- c. Ford, Electrical Systems, Student Text

Tools and Equipment:

- a. Soldering iron
- (Continued on back)

LAB HOURS	4
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CLASS HOURS	2
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EVALUATION

(AC-01)

- a. Given necessary tools and equipment, the learner will locate a wire using the diagram and splice the wire checking to insure maximum current flow through splices and connections. All splices and connections must meet standards set by manufacturers.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 95.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- b. Wire stripping tool
- c. Wiring diagrams
- d. Solderless connectors and tools

TASK

AC-02 Testing and maintaining electrical protection devices

PERFORMANCE OBJECTIVE

Test and replace circuit breakers and fusible links.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Breakers
- b. Fusible links
- c. Charging system principles
- d. Basic electricity

Provide Demonstration On:

- a. Checking system with defective circuit breaker
- b. Checking charging system with faulty fusible link

Provide Practical Application On:

- a. Locating circuit breakers
- b. Locating fusible links
- c. Testing circuit breakers
- d. Replacing protection devices

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Remling, Basics
- c. Toboldt, Automotive Encyclopedia

A/Vs:

Georgia, "Troubleshooting Lighting Systems and Setting Head Lamps," slide set

Student Manuals:

Georgia, Auto Mechanics, Unit 243-4

Tools and Equipment:

- a. Service manual
- b. Hand tools
- c. VOM
- d. Test light

LAB HOURS 4

CLASS HOURS 6

EVALUATION

(AC-02)

- a. Given an electrical system and tools and equipment, the learner will test lighting and charging circuit wiring and detect inoperable fusible links and circuit protectors. All repairs must comply with manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-03 Testing and repairing the courtesy light

PERFORMANCE OBJECTIVE

Test and repair the courtesy light circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Basic electricity
- b. Fuses
- c. Light switches
- d. Electrical circuits

Provide Demonstration On:

- a. Shorted fuse to courtesy light circuit
- b. Loss of ground to courtesy light

Provide Practical Application On:

- a. Determining cause of defective courtesy light
- b. Locating courtesy lamp
- c. Locating courtesy lamp fuse

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Georgia, "Troubleshooting Lighting Systems and Setting Head Lamps," slide set; "Testing Electrical Wiring Condition," film-strip
- b. Ford, "Electrical Systems...", "slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Units 201-1, 243-4
- b. Oklahoma, Auto Mechanics II

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-03)

- a. Given a vehicle and necessary tools and equipment, the learner will test and repair problems in the courtesy light circuit according to the manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task No. 89.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-04 Testing and repairing the parking light and marker lamp circuits

PERFORMANCE OBJECTIVE

Test and repair the parking and marker light circuits.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Parallel electrical circuits
- b. Electricity fundamentals
- c. Basic electrical theory
- d. Filament types

Provide Demonstration On:

- a. Types of circuits
- b. Types of parking light bulbs
- c. Use of volt/ohm meter
- d. Light switches
- e. Wiring diagrams

Provide Practical Application On:

- a. Testing parallel circuits
- b. Testing headlamp switches
- c. Testing parking light circuits
- d. Tracing wires using a schematic diagram

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Remling, Basics
- c. Toboldt, Automotive Encyclopedia

A/Vs:

Georgia, "Troubleshooting Lighting Systems and Setting Head Lamps," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. VOM
- b. Test light
- c. Shop manual
- d. Hand tools

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-04)

- a. Given a vehicle and necessary tools and equipment, the learner will check a light circuit. All defects will be repaired according to the manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 89, 90.

TASK

AC-05 Testing and repairing the back-up light circuit

PERFORMANCE OBJECTIVE

Test and repair the back-up light circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Electrical circuits
- b. Troubleshooting electric circuits
- c. Basic electrical theory
- d. Back-up light switches and operation

Provide Demonstration On:

- a. Types of circuits
- b. Types of back-up light switches
- c. Types of light bulbs
- d. Wiring diagrams and their uses

Provide Practical Application On:

- a. Locating back-up light switch
- b. Testing back-up light circuit
- c. Tracing back-up light wires

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Remling, Basics
- c. Toboldt, Automotive Encyclopedia

A/Vs:

Georgia, "Troubleshooting Lighting Systems and Setting Head Lamps," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. VOM
- b. Test light
- c. Shop manual
- d. Hand tools
- e. Soldering iron

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-05)

- a. Given a vehicle and necessary tools and equipment, the learner will check and repair back-up light circuit. All defects will be repaired according to the manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 89, 90.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-06 Testing and repairing the headlight circuit

PERFORMANCE OBJECTIVE

Test and repair the headlight circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Electrical circuits
- b. Electricity fundamentals
- c. Electrical theory of headlight circuits
- d. Headlight circuit components

Provide Demonstration On:

- a. Headlight switch operation
- b. Headlight switch removal
- c. Wiring diagrams and their uses

Provide Practical Application On:

- a. Testing headlight switches
- b. Testing headlight circuits
- c. Locating dimmer switches
- d. Testing dimmer switches

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Remling, Basics
- c. Toboldt, Automotive Encyclopedia

A/Vs:

- a. Georgia, "Troubleshooting Electrical Systems and Setting Head Lamps," slide set
- b. Prentice-Hall, "Basic Automotive Service," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. VOM
- b. Test light
- c. Shop manual
- d. Hand tools
- e. Soldering iron

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-06)

- a. Given a vehicle and necessary tools and equipment, the learner will troubleshoot and repair the headlamp circuit. All defects will be repaired according to the manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 89, 90.

TASK

AC-07 Testing and repairing the turn signal circuit

PERFORMANCE OBJECTIVE

Test and repair the turn signal circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Turn signal types
- b. Flasher types
- c. Bulb filament types
- d. Wiring types

Provide Demonstration On:

- a. Location of turn signal
- b. Turn signal removal
- c. Location of flasher
- d. Testing flasher
- e. Testing turn signal circuit

Provide Practical Application On:

- a. Locating turn signal
- b. Removing components for accessibility to turn signal
- c. Locating flasher

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Remling, Basics
- c. Toboldt, Automotive Encyclopedia

A/Vs:

- a. Georgia, "Troubleshooting Lighting Systems and Setting Head Lamps," slide set
- b. Prentice-Hall, "Basic Automotive Service," film-strip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Test light
- b. VOM
- c. Hand tools
- d. Soldering iron

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-07)

- a. Given a vehicle and necessary tools and equipment, the learner will test, remove and replace the components of the turn signal circuit according to procedures found in the shop manual and in accordance with manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 89, 90.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-08 Testing and repairing the brake light circuit

PERFORMANCE OBJECTIVE

Test and repair the brake light circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Electrical circuits
- b. Brake light switch fundamentals of operation

Provide Demonstration On:

- a. Location of brake light switch
- b. Use of test light
- c. Location of wiring diagram needed

Provide Practical Application On:

- a. Locating brake light
- b. Locating problems in wiring circuit
- c. Using test light
- d. Tracing wires of brake light circuit

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Remling, Basics
- c. Toboldt, Automotive Encyclopedia

A/Vs:

Georgia, "Troubleshooting Electrical Systems and Setting Head Lamps," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Soldering iron
- c. VOM
- d. Test light

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-08)

- a. Given a vehicle and necessary tools and equipment, the learner will test components of the brake light circuit. The learner will demonstrate skills in using the VOM and test light to repair circuit to the manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 89, 90.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-09 Testing and repairing the horn circuit

PERFORMANCE OBJECTIVE

Test and repair the horn circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Horn circuits
- b. Horn components

Provide Demonstration On:

- a. Location of horn
- b. Location of horn ring and contact
- c. Location of horn relay
- d. Testing circuit with voltmeter

Provide Practical Application On:

- a. Troubleshooting horn system
- b. Repairing or replacing horn ring or contact
- c. Tuning horn
- d. Testing and replacing relays

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Toboldt, Automotive Encyclopedia

A/Vs:

Georgia, "Troubleshooting Lighting Systems and Setting Head Lamps," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Voltmeter
- b. Jumper wire
- c. Hand tools

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-09)

- a. Given a vehicle and necessary tools and equipment, the learner will test the horn circuit with the voltmeter. The learner will remove steering wheel or horn cover for accessibility to horn ring and contact, locate and remove the horn relay. The learner will repair the horn circuit according to the manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task Nos. 89, 90.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-10 Testing and repairing the windshield wiper circuit (air or electric)

PERFORMANCE OBJECTIVE

Test and repair the windshield wiper circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Windshield wiper electrical circuits
- b. Windshield wiper motor types

Provide Demonstration On:

- a. Windshield wiper switch removal
- b. Windshield wiper motor removal
- c. Circuit testing

Provide Practical Application On:

- a. Testing windshield wiper motor circuit
- b. Removing and replacing windshield wiper motor
- c. Replacing windshield wiper switch

INSTRUCTIONAL MATERIALS

Textbooks:

Toboldt, Automotive Encyclopedia

A/Vs:

Georgia, "Repairing or Replacing Windshield Wiper Motor or Control," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-2
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. VOM
- b. Test light
- c. Jumper lead
- d. Hand tools

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-10)

- a. Given a vehicle and necessary tools and equipment, the learner will test and repair the components of the windshield wiper circuit and repair according to the manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 93.

TASK

AC-11 Testing and repairing the windshield washer circuit

PERFORMANCE OBJECTIVE

Test and repair the windshield washer circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Windshield washer pump operation
- b. Pump electrical circuits
- c. Pump water circuits

Provide Demonstration On:

- a. Types of washer/wiper switches
- b. Windshield washer pump disassembly
- c. Windshield washer pump inspection
- d. Testing windshield washer pump electrical circuit

Provide Practical Application On:

- a. Disassembling windshield washer pump
- b. Inspecting windshield washer pump
- c. Testing windshield washer electrical circuit

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Toboldt, Automotive Encyclopedia

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-2
- b. Oklahoma, Auto Mechanics II

A/Vs:

Georgia, "Repairing or Replacing Windshield Wiper Motor or Control," slide set

Tools and Equipment:

- a. Pressure tester
- b. VOM
- c. Test light
- d. Hand tools
- e. Shop manual

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-11)

- a. Given a vehicle and necessary tools and equipment, the learner will test and repair switches and pumps of the windshield washer circuit according to the manufacturer's specifications. The learner will aim pressure nozzles to exact location on the windshield for best results.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-12 Testing and replacing instrument gauge and sending unit

PERFORMANCE OBJECTIVE

Test and replace instrument gauge and sending unit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Printed circuits
- b. Instrument gauges
- c. Sending unit

Provide Demonstration On:

- a. Instrument gauge removal
- b. Sending unit location
- c. Removing sending unit

Provide Practical Application On:

- a. Removing and testing printed circuits
- b. Removing instrument gauge
- c. Removing sending unit
- d. Testing instrument gauge
- e. Testing sending unit
- f. Replacing instrument gauge
- g. Replacing sending unit

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Electrical Equipment

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. VOM
- b. Shop manual
- c. Hand tools

LAB HOURS 10

CLASS HOURS 3

EVALUATION

(AC-12)

- a. Given a vehicle and necessary tools and equipment, the learner will troubleshoot all gauges and instruments on the vehicle and repair or replace as needed according to vehicle manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

AC-13 Testing and repairing the CB radio power circuit

PERFORMANCE OBJECTIVE

Test and repair the CB radio power circuit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Transmitting devices
- b. Radio frequency
- c. CB radio operation
- d. CB radio electrical supply circuits

Provide Demonstration On:

- a. Testing CB radio supply circuits
- b. Testing frequency
- c. Testing CB antenna for transmitting efficiency

Provide Practical Application On:

- a. Testing CB radio electrical supply circuit
- b. Testing frequency
- c. Testing CB antenna for transmitting efficiency

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Electrical Equipment
- b. Schultz, How to Repair CB Radios

Tools and Equipment:

- a. VOM
- b. Frequency/layout meter
- c. Hand tools
- d. Operator's handbook

LAB HOURS 10

CLASS HOURS 3

EVALUATION

(AC-13)

Given a vehicle with a CB radio and necessary tools and equipment, the learner will test and repair the components of the CB radio power supply circuit according to the manufacturer's specifications.

TASK

AC-14 Testing and trimming the CB radio antenna

PERFORMANCE OBJECTIVE

Test and trim the radio antenna.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Wave frequency
- b. Band operation

Provide Demonstration On:

- a. Testing antenna height for reception
- b. Trimming antenna

Provide Practical Application On:

- a. Testing antenna for most efficient reception
- b. Trimming antenna for most efficient reception

INSTRUCTIONAL MATERIALS

Textbooks:

Schultz, How to Repair CB Radios

Tools and Equipment:

- a. Reception meters
- b. Screwdriver
- c. Manual

LAB HOURS

4

CLASS HOURS

2

EVALUATION

(AC-14)

Given a vehicle with CB AM/FM radio and necessary tools and equipment, the learner will test and trim the antenna to the most efficient radio operation and according to the manufacturer's specifications.

TASK

AC-15 Testing and repairing fog lights

PERFORMANCE OBJECTIVE

Test and repair fog lights.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Fog light operation
- b. Candle power rating
- c. Sealed beam qualities
- d. Fog light circuits

Provide Demonstration On:

- a. Fog light bulb inspection and testing
- b. Testing fog light circuits
- c. Aiming fog lights

Provide Practical Application On:

- a. Inspecting fog light bulbs
- b. Testing fog light circuits
- c. Aiming fog lights
- d. Installing fog light kit

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Electrical Equipment

Tools and Equipment:

- a. VOM
- b. Hand tools
- c. Shop manual

LAB HOURS 10

CLASS HOURS 2

III-207

EVALUATION

(AC-15)

Given a vehicle with fog lights and necessary tools and equipment, the learner will test and repair the fog lights according to the manufacturer's specifications. The learner will also install and aim fog lights for most efficient operation and safety.

TASK

AC-16 Testing system air conditioning performance

PERFORMANCE OBJECTIVE

Test system air conditioning performance.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Visual inspection
 1. Belts
 2. Bracketts
 3. Lines
 4. Condensor
 5. Compressor oil and clutch
 6. Ducts
 7. Evaporator
 8. Blower motor operation
 9. Any signs of leaking
 10. System air filters
 11. Sight glass for bubbles
- b. Gauge connections (high and low side)
- c. Pressure reading compared to ambient temperature

Provide Demonstration On:

- a. Visual inspection
- b. Gauge connections
- c. Gauge reading

Provide Practical Application On:

- a. Developing and using a checklist for a visual inspection
- b. Connecting gauges and measuring pressures and making temperature comparisons

INSTRUCTIONAL MATERIALS

Textbooks:

Dwiggins, Automotive Air Conditioning

A/Vs:

- a. Georgia, "Performance Testing Air Conditioning Systems," slide set; "Testing Performance of Air Conditioning," slide set
- b. Ford, "Air Conditioning-How It Works," filmstrip; "Air Conditioning Principles," transparencies

Student Manuals:

- a. Georgia, Auto Mechanics, Units 243-8, 263-1
- b. Ford, Air Conditioning - How It Works
- c. Oklahoma, Auto Mechanics II

(Continued on back)

LAB HOURS 6

CLASS HOURS 4

EVALUATION (AC-16)

- a. Given a vehicle with air conditioner and necessary tools and equipment, the learner will visually inspect the air conditioning system, performance test system and record results. All defects must be noted and recordings must be within 10% of the instructor's.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 208.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Air conditioned vehicle
- b. Hand tools
- c. Gauge set
- d. Service manual

TASK

AC-16 Testing system air conditioning performance

PERFORMANCE OBJECTIVE

Test system air conditioning performance.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Visual inspection
 1. Belts
 2. Bracketts
 3. Lines
 4. Condensor
 5. Compressor oil and clutch
 6. Ducts
 7. Evaporator
 8. Blower motor operation
 9. Any signs of leaking
 10. System air filters
 11. Sight glass for bubbles
- b. Gauge connections (high and low side)
- c. Pressure reading compared to ambient temperature

Provide Demonstration On:

- a. Visual inspection
- b. Gauge connections
- c. Gauge reading

Provide Practical Application On:

- a. Developing and using a checklist for a visual inspection
- b. Connecting gauges and measuring pressures and making temperature comparisons

INSTRUCTIONAL MATERIALS

Textbooks:

Dwiggins, Automotive Air Conditioning

A/Vs:

- a. Georgia, "Performance Testing Air Conditioning Systems," slide set; "Testing Performance of Air Conditioning," slide set
- b. Ford, "Air Conditioning-How It Works," filmstrip; "Air Conditioning Principles," transparencies

Student Manuals:

- a. Georgia, Auto Mechanics, Units 243-8, 263-1
- b. Ford, Air Conditioning - How It Works
- c. Oklahoma, Auto Mechanics II

(Continued on back)

LAB HOURS 6

CLASS HOURS 4

EVALUATION (AC-16)

- a. Given a vehicle with air conditioner and necessary tools and equipment, the learner will visually inspect the air conditioning system, performance test system and record results. All defects must be noted and recordings must be within 10% of the instructor's.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 208.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Air conditioned vehicle
- b. Hand tools
- c. Gauge set
- d. Service manual

TASK

AC-17 Discharging the system

PERFORMANCE OBJECTIVE

Discharge and purge the system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Safety precautions
- b. Gauge connections
- c. Stabilizing system
- d. Procedures
 1. Connecting gauges
 2. Adjusting controls to maximum cool and operate for 15 minutes
 3. Engine speed to idle
 4. Opening low side with discharge hose in container
 5. Opening high side
 6. Closing when refrigerant ceases to flow
 7. Both gauges should read "0"

Provide Demonstration On:

Discharging the system

Provide Practical Application On:

Discharging the system

INSTRUCTIONAL MATERIALS

Textbooks:

Dwiggins, Automotive Air Conditioning

A/Vs:

- a. Georgia, "Testing Performance of Air Conditioner," slide set
- b. Ford, "Air Conditioning Systems," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 263-I
- b. Ford, Air Conditioning Systems
- c. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Refrigeration wrenches
- c. Gauges

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(AC-17)

- a. Given a vehicle with air conditioner and necessary tools and equipment, the learner will discharge the system. Upon completion, there must be no refrigerant left in the system.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 205.

TASK

AC-18 Evacuating and charging the system

PERFORMANCE OBJECTIVE

Remove all moisture from system through evacuation and recharge system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Safety precautions
- b. Reasons for evacuation
- c. Gauge connections
- d. Procedures
 1. Connecting gauges
 2. Installing center hose
 3. Opening high and low side service valves (if used)
 4. Opening high and low side manifold gauge valves
 5. Operating pump for 30 minutes
 6. Observing gauge for vacuum

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

Dwiggins, Automotive Air Conditioning

A/Vs:

- a. Georgia, "Evacuating and Charging Air Conditioning System," slide set
- b. Prentice-Hall, "Automobile Air Conditioners," film-strip

Provide Demonstration On:

Evacuating and charging system

Provide Practical Application On:

Evacuating and charging system

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 243-10
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Vehicle
- b. Refrigeration tools
- c. Gauges
- d. Refrigerant
- e. Pump and charging station
- f. Shop manual

LAB HOURS 6

CLASS HOURS 2

III-213

EVALUATION

(AC-18)

- a. Given a vehicle with air conditioner and necessary tools and equipment, the learner will evacuate and recharge the system. The manufacturer's specifications must be met.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 205, 206.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- 7. Closing gauge valves
- 8. Shutting off valves
- 9. Observing gauge for signs of leaking (system should hold (vacuum))
- e. Low side charging
- f. High side charging

TASK

AC-19 Rebuilding compressors

PERFORMANCE OBJECTIVE

Perform a compressor overhaul on a piston and swash-plate type compressor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Compressor types and designs
- b. Seals
- c. Internal parts
- d. Special tools

Provide Demonstration On:

- a. Disassembling and inspecting compressor
- b. Reassembling with new plate

Provide Practical Application On:

Rebuilding both types of compressors

INSTRUCTIONAL MATERIALS

Textbooks:

Dwiggins, Automotive Air Conditioning

A/Vs:

- a. Georgia, "Replacing Compressor Seal and Checking Compressor Oil," slide set; "Overhauling a York or Tecumseh Compressor," slide set; "Testing and Overhauling a Six Cylinder General Motors Type Air Conditioner Compressor," slide set
- b. Prentice-Hall, "Automobile Air Conditioners," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Units 243-II, 263-3, 263-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Special tools
- b. Hand tools
- c. Different types of compressors
- d. Service manual

LAB HOURS 6

CLASS HOURS 4

III-215

EVALUATION

(AC-19)

- a. Given a vehicle air conditioner compressor and necessary tools and equipment, the learner will overhaul the unit. All work must be within the manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 210, 214, 216.

TASK

AC-20 Replacing refrigerant lines and accessories

PERFORMANCE OBJECTIVE

Replace lines, sight glass, receiver-dryer, expansion valve and POA valve.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Each component and its function
- b. High and low pressure hoses and lines
- c. Safety
- d. Methods of replacement

Provide Demonstration On:

Replacing components

Provide Practical Application On:

Replacing lines and components

INSTRUCTIONAL MATERIALS

Textbooks:

Dwiggins, Automotive Air Conditioning

A/Vs:

Georgia, "Replacing Refrigerant Hose, Dryer or Filters," slide set; "Testing and /or Replacing a POA or Expansion Valve," slide set

Student Manuals:

Georgia, Auto Mechanics, Units 243-12, 263-5, 263-6

Tools and Equipment:

- a. Refrigeration tools
- b. Various accessories
- c. Lines and tubing
- d. Service manual

LAB HOURS 8

CLASS HOURS 2

EVALUATION

(AC-20)

- a. Given a vehicle with air conditioner and necessary tools and equipment, the learner will replace a flexible or metal line, a receiver-dryer, expansion valve, sight glass and POA valve. The system must operate within the manufacturer's specifications when charged.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 219, 220, 221.

TASK

AC-21 Installing air conditioning units

PERFORMANCE OBJECTIVE

Install and operate an "add-on" air conditioning unit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Review of components
- b. Interpreting manufacturer's instructions
- c. Safety
- d. Testing unit

Provide Demonstration On:

Reading and interpreting manufacturer's instructions

Provide Practical Application On:

Installing an "add-on" unit in a live vehicle or mock-up lab engine

INSTRUCTIONAL MATERIALS

A/Vs:

Georgia, "Installing Add-on Air Conditioner," slide set

Tools and Equipment:

- a. Hand and refrigeration tools
- b. Add-on kit
- c. Gauges
- d. Manufacturer's installation instructions

LAB HOURS 24

CLASS HOURS 6

EVALUATION

(AC-21)

- a. Given a vehicle (live or mock-up) and necessary tools and equipment, the learner will install the air conditioner unit and operate it. The unit must perform to the manufacturer's specifications. All related work must be according to the installation instructions and without damage to the vehicle.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task Nos. 207, 215, 217, 218, 222.

TASK

AC-22 Diagnosing air conditioning problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan to locate problems in the air conditioning system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Troubleshooting procedures
- b. Using sight, touch and smell
- c. Using the gauges and a thermometer
- d. Testing for leaks

Provide Demonstration On:

- a. Locating problems using a troubleshooting chart
- b. Using a leak tester

Provide Practical Application On:

Developing and using a troubleshooting plan on a unit with a known malfunction

INSTRUCTIONAL MATERIALS

Textbooks:

Dwiggins, Automotive Air Conditioning

A/Vs:

Prentice-Hall, "Automobile Air Conditioners," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Gauges
- b. Thermometer
- c. Leak tester
- d. Troubleshooting chart

LAB HOURS	4
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CLASS HOURS	4
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EVALUATION

(AC-22)

- a. Given a vehicle air conditioning system with a known problem and necessary tools and equipment, the learner will locate the problem and recommend repairs that are needed. Problems must be discovered by using a troubleshooting plan and recommendations must be within the manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 204.

TASK

PT-01 Adjusting and repairing clutch and shift linkage

PERFORMANCE OBJECTIVE

Adjust and repair clutch and shift linkage.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Clutch function
- b. Clutch and flywheel assembly
- c. Clutch linkage
- d. Clutch disc construction
- e. Pressure plate construction
- f. Shift linkage function
- g. Shift linkage types

Provide Demonstration On:

- a. Adjusting clutch
- b. Repairing clutch
- c. Adjusting shift linkage
- d. Repairing shift linkage

Provide Practical Application On:

- a. Adjusting and repairing clutch
- b. Adjusting and repairing shift linkage

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

Student Manuals:

Georgia, Auto Mechanics, Unit 241-3

A/Vs:

- a. Georgia, "Replacing Clutch," slide set
- b. Bergwall, "The Automotive Clutch Assembly Explained," filmstrip
- c. Ford, "Car and Truck Clutches," transparencies

Tools and Equipment:

- a. Hand tools
- b. Shop repair manual

LAB HOURS	8
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CLASS HOURS	6
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EVALUATION

(PT-01)

- a. Given an operational manual transmission system and necessary tools and equipment, the learner will adjust and repair clutch and shift linkage to operate within manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task Nos. 29, 30.

TASK

PT-02 Removing and disassembling transmission

PERFORMANCE OBJECTIVE

Remove and disassemble manual transmission.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Transmission function
- b. 3-speed manual transmission
- c. 4-speed manual transmission
- d. 5-speed manual transmission
- e. Transaxle assembly front or rear

Provide Demonstration On:

- a. Removing and disassembling a transmission
- b. Removing and disassembling a transaxle assembly

Provide Practical Application On:

- a. Removing and disassembling a transmission
- b. Removing and disassembling a transaxle assembly

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

Tools and Equipment:

- a. Hand tools
- b. Shop repair manual

A/Vs:

- a. Georgia, "Overhauling a 3-speed Transmission," slide set
- b. Bergwall, "The Automotive Standard Transmission Explained," filmstrip

(Continued on back)

LAB HOURS 20

CLASS HOURS 4

EVALUATION

(PT-02)

- a. Given an operational manual transmission system and necessary tools and equipment, the learner will remove the transmission and disassemble it according to standards of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task Nos. 37, 50.

INSTRUCTIONAL MATERIALS

A/Vs:

- c. Ford, "Manual Shift 3-speed Overdrive Transmissions," transparencies;
"Manual Shift 3- and 4-speed Transmissions," transparencies
- d. Georgia, "Overhauling Syncromesh 4-speed Transmission," slide set

TASK

PT-03 Inspecting and reassembling transmission

PERFORMANCE OBJECTIVE

Inspect and reassemble the manual transmission.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. 3-speed transmission inspection
- b. 4-speed transmission inspection
- c. 5-speed transmission inspection
- d. 10-speed and above transmissions

Provide Demonstration On:

- a. Inspecting and reassembling a transmission
- b. Inspecting and reassembling a transaxle assembly

Provide Practical Application On:

- a. Inspecting and reassembling a transmission
- b. Inspecting and reassembling a transaxle assembly

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Georgia, "Overhauling a 3-speed Transmission," slide set
- b. Bergwall, "The Automotive Standard Transmission Explained," filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 241-2, 241-4
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Micrometer
- c. Dial indicator
- d. Shop repair manual
- e. Feeler gauge

LAB HOURS 20

CLASS HOURS 4

EVALUATION

(PT-03)

- a. Given a disassembled manual transmission and necessary tools and equipment, the learner will inspect and reassemble the transmission according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Oklahoma, Automotive Mechanics II.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- e. V'TECS, Automotive Mechanics, Task Nos. 38, 46, 47, 66.

INSTRUCTIONAL MATERIALS

A/Vs:

- c. Prentice-Hall, "Servicing the Standard Transmission," filmstrip
- d. Georgia, "Overhauling Syncromesh 4-speed Transmission," slide set

TASK

PT-04 Removing and replacing clutch assembly

PERFORMANCE OBJECTIVE

Remove and replace the clutch assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Clutch function
- b. Power flow
- c. Disassembly of clutch
- d. Assembly of clutch
- e. Aligning clutch disc
- f. Identifying front and rear of clutch disc

Provide Demonstration On:

- a. Removing clutch assembly
- b. Replacing clutch assembly

Provide Practical Application On:

Removing and replacing clutch assembly

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains;
Automotive Mechanics

A/Vs:

- a. Georgia, "Replacing Clutch," slide set
- b. Bergwall, "The Automotive Clutch Assembly Explained," filmstrip
- c. Prentice-Hall, "Servicing the Standard Clutch," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 241-3
- b. Oklahoma, Auto Mechanics II
- c. Ford, Diagnosis of Clutch, Student Text

Tools and Equipment:

- a. Hand tools
- b. Dial indicator set
- c. Clutch aligning tool
- d. Shop repair manual

LAB HOURS 12

CLASS HOURS 2

EVALUATION

(PT-04)

- a. Given an operational manual transmission system and necessary tools and equipment, the learner will remove and replace the clutch assembly according to standards of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task Nos. 39, 45, 49, 52.

TASK

PT-05 Removing and replacing the flywheel ring gear

PERFORMANCE OBJECTIVE

Remove and replace the flywheel ring gear.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Function of flywheel
- b. Function of flywheel
- c. Methods of removing ring gear
- d. Methods of expanding ring gear to fit flywheel

Provide Demonstration On:

- a. Removing flywheel ring gear
- b. Replacing flywheel ring gear

Provide Practical Application On:

Removing and replacing flywheel ring gear

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Hand tools
- b. Acetylene torch
- c. AC welder

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(PT-05)

- a. Given a vehicle with standard transmission removed and necessary tools and equipment, the learner will remove and replace the flywheel ring gear according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 21.

TASK

PT-06 Diagnosing manual transmission problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan to locate problems in the manual transmission.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Manual transmission function
- b. Manual transmission construction
- c. Identifying problems by sound

Provide Demonstration On:

Diagnosing manual transmission problems

Provide Practical Application On:

Identifying a problem and describing the cause for a known standard transmission malfunction on a live vehicle

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Georgia, "Overhauling a 3-speed Transmission," slide set; "Replacing Clutch," slide set; "Overhauling Syncromesh 4-speed Transmission," slide set
- b. Bergwall, "The Automotive Standard Transmission Explained," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Units 241-2, 241-3, 241-4
- b. Ford, Diagnosis of Manual Transmissions, Student Text

Tools and Equipment:

- a. Hand tools
- b. Dial indicator
- c. Micrometer
- d. Clutch aligning tool
- e. Shop repair manual

LAB HOURS 8

CLASS HOURS 4

EVALUATION

(PT-06)

- a. Given an operational vehicle with a defective manual transmission and necessary tools and equipment, the learner will formulate a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 54.

TASK

PT-07 Inspecting the drive shaft

PERFORMANCE OBJECTIVE

Inspect the drive shaft for warpage or wear.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Drive shaft operation
- b. Drive shaft components
- c. Universal joints
- d. Two and three piece drive shafts

Provide Demonstration On:

- a. Drive shaft removal
- b. Drive shaft inspection
- c. Balancing drive shaft

Provide Practical Application On:

- a. Removing drive shaft from vehicle
- b. Inspecting drive shaft

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics
- b. Toboldt, Automotive Mechanics

A/Vs:

- a. Georgia, "Servicing U-joints and Drive Shaft," slide set
- b. Prentice-Hall, "Servicing the Drive Shaft and Universal Joints," filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 241-1
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Grease dispenser
- b. Hand tools
- c. Twin post lift
- d. Shop manual
- e. Drive shaft

LAB HOURS	2
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CLASS HOURS	2
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EVALUATION

(PT-07)

- a. Given a vehicle and necessary tools and equipment the learner will inspect the drive shaft for wear or out of balance and make recommendations for repair. Recommendations must conform with manufacturer's specifications.
- b. V'TECS, Automotive Mechanics, Task No. 33.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- c. Bergwall, "Drive Shaft and Universal Joints Explained," filmstrip
- d. Cummins, "Drive Lines," slide set

TASK

PT-08 Removing and replacing universal joints

PERFORMANCE OBJECTIVE

Remove and replace universal joints.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Universal joint location
- b. Universal joint inspection

Provide Demonstration On:

- a. Universal joint removal
- b. Universal joint inspection
- c. Replacing universal joint

Provide Practical Application On:

- a. Removing universal joint
- b. Inspecting universal joint
- c. Replacing universal joint

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics
- b. Toboldt, Automotive Mechanics

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 241-1
- b. Oklahoma, Auto Mechanics II

A/Vs:

- a. Georgia, "Servicing U-joints and Drive Shaft," slide set
- b. Prentice-Hall, "Servicing the Drive Shaft and Universal Joints," filmstrip

Tools and Equipment:

- a. Hand tools
- b. Press
- c. Grease dispenser
- d. Shop manual
- e. Drive shaft and u-joints

LAB HOURS 10

CLASS HOURS 2

III-237

EVALUATION

(PT-08)

- a. Given a vehicle with defective universal joint(s) and necessary tools and equipment the learner will inspect, remove and replace the joint according to manufacturer's specifications. The installed joint must turn freely without binding.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

PT-09 Removing and repairing constant velocity joints

PERFORMANCE OBJECTIVE

Remove and repair a constant velocity joint.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Constant velocity joint application
- b. Constant velocity joint operation
- c. The need for constant velocity joints

Provide Demonstration On:

- a. Constant velocity joint location
- b. Constant velocity joint removal
- c. Constant velocity joint inspection
- d. Constant velocity joint repair

Provide Practical Application On:

- a. Locating constant velocity joint
- b. Removing constant velocity joint
- c. Inspecting constant velocity joint
- d. Repairing constant velocity joint

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Transmissions and Power Trains
- b. Toboldt, Automotive Encyclopedia

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Shop manuals

LAB HOURS 8

CLASS HOURS 4

EVALUATION

(PT-09)

- a. Given a vehicle with a defective constant velocity joint and necessary tools and equipment, the learner will inspect, remove and repair constant velocity joints according to manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

PT-10 Removing and replacing rear axle bearings

PERFORMANCE OBJECTIVE

Remove and replace rear axle bearings.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Axle bearing construction (full floating, etc.)
- b. Types of axle bearings
- c. Axle bearing operation
- d. Axle bearing splitter device
- e. Safety while removing and pressing bearing on shaft

Provide Demonstration On:

- a. Hydraulic press operation
- b. Axle bearing removal
- c. Axle bearing replacement
- d. Proper safety procedures

Provide Practical Application On:

- a. Removing axle bearing with splitter and puller
- b. Inspecting axle
- c. Pressing bearing on axle with hydraulic press
- d. Replacing axle

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains

A/Vs:

Georgia, "Replacing and Adjusting Taper-type Rear Axle Bearings," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 241-7
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hydraulic press
- b. Axle bearing splitter and puller
- c. Shop manual
- d. Axle shaft

LAB HOURS 12

CLASS HOURS 2

EVALUATION

(PT-10)

- a. Given a vehicle with a defective axle bearing and necessary tools and equipment the learner will remove and replace the rear axle bearing using procedures recommended in the repair manual. The bearing must seat properly and rotate freely.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 50.

TASK

PT-11 Removing and disassembling differential assembly

PERFORMANCE OBJECTIVE

Removing and disassembling differential assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Differential function
- b. Differential types
- c. Differential construction
- d. Parts which must be removed to gain access
- e. Ring gear and pinion, planetary gears, axle gears and all bearings
- f. 2-speed rear ends
- g. Power dividers
- h. Axle interlock devices

Provide Demonstration On:

- a. Removing differential assembly
- b. Disassembling differential assembly

Provide Practical Application On:

Removing and disassembling differential assembly

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Georgia, "Overhauling Removal Carrier-type Differential," slide set, filmstrip; "Overhauling Integral Carrier-type Rear Axle," filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 241-5
- b. Oklahoma, Auto Mechanics II
- c. Ford, Rear Axle and Drive Shaft, Student Text

Tools and Equipment:

- a. Hand tools
- b. Dial indicator set

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LAB HOURS	15
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CLASS HOURS	10
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EVALUATION

(PT-11)

- a. Given an operational differential assembly and necessary tools and equipment, the learner will remove and disassemble the differential according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 40.

INSTRUCTIONAL MATERIALS:

A/Vs:

- b. Bergwall, "The Automotive Differential Explained," filmstrip
- c. Ford, "Rear Axle and Drive Shaft," filmstrip

Tools and Equipment:

- c. Assorted bearing pullers
- d. Hydraulic press
- e. Manufacturer's repair manual

TASK

PT-12 Inspecting and reassembling differential assembly

PERFORMANCE OBJECTIVE

Inspect and assemble differential assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Differential function
- b. Differential types
- c. Differential construction
- d. Differential setup and adjustment
- e. Proper tooth patterns
- f. Pinion pre-load

Provide Demonstration On:

- a. Inspecting differential assembly
- b. Assembling differential assembly

Provide Practical Application On:

Inspecting, assembling and adjusting differential

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Georgia, "Overhauling Removal-type Differential," filmstrip; "Overhauling Integral-type Rear Axle," filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 241-5
- b. Oklahoma, Auto Mechanics II
- c. Ford, Rear Axle Diagnosis and Repairs, Student Text

Tools and Equipment:

- a. Hand tools
- b. Dial indicator

(Continued on back)

LAB HOURS 25

CLASS HOURS 5

EVALUATION

(PT-12)

- a. Given a disassembled differential assembly and necessary tools and equipment, the learner will inspect and assemble the differential according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task Nos. 40, 41.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Bergwall, "The Automotive Differential Explained," filmstrip; "The Limited Slip Differential Explained," filmstrip
- c. Ford, "Rear Axle Diagnosis and Repair," filmstrip

Tools and Equipment:

- c. Assorted bearing pullers
- d. Hydraulic press
- e. Gear tooth marking compound
- f. Manufacturer's repair manual

TASK

PT-13 Removing and replacing front drive axle assembly

PERFORMANCE OBJECTIVE

Remove and replace front drive axle assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Front drive axle function
- b. Front drive axle types
- c. Front drive axle construction

Provide Demonstration On:

- a. Removing front drive axle assembly
- b. Replacing front drive axle assembly

Provide Practical Application On:

Removing and replacing front drive axle assembly

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains

Tools and Equipment:

- a. Hand tools
- b. Special tools called for by manufacturer's manual
- c. Shop repair manual

LAB HOURS 30

CLASS HOURS 5

EVALUATION

(PT-13)

- a. Given an operational front drive axle assembly and necessary tools and equipment, the learner will remove and replace the front axle drive assembly according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 43, 44.

TASK

PT-14 Rebuilding four-wheel drive locking hubs

PERFORMANCE OBJECTIVE

Rebuild four-wheel-drive locking hubs.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Locking hub operation
- b. Types of locking hubs
- c. Locking hub construction
- d. Planet and carrier type differentials

Provide Demonstration On:

- a. Locking hub removal
- b. Locking hub inspection
- c. Locking hub rebuilding

Provide Practical Application On:

- a. Removing locking hub
- b. Disassembling locking hubs
- c. Inspecting components of locking hub
- d. Rebuilding locking hub

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Hand tools
- b. Shop manual
- c. Four-wheel-drive vehicle

LAB HOURS 12

CLASS HOURS 2

EVALUATION

(PT-14)

- a. Given a four-wheel drive vehicle with defective locking hub and necessary tools and equipment, the learner will disassemble, inspect and rebuild the hub(s) according to manufacturer's specifications. Upon completion the hub must operate correctly without binding or noisy operation.
- b. V'TECS, Automotive Mechanics, Task Nos. 43, 44.

TASK

PT-15 Rebuilding the four wheel drive transfer case

PERFORMANCE OBJECTIVE

Rebuild the four wheel drive transfer case.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Four wheel drive transfer case function
- b. Four wheel drive transfer case construction
- c. Four wheel drive transfer case types

Provide Demonstration On:

- a. Removing transfer case function
- b. Four wheel drive transfer case construction
- c. Four wheel drive transfer case types

Provide Practical Application On:

- a. Removing transfer case
- b. Inspecting transfer case
- c. Rebuilding transfer case
- d. Installing transfer case

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Hand tools
- b. Special tools called for by manufacturer's manual
- c. Shop repair manual

LAB HOURS 30

CLASS HOURS 4

EVALUATION

(PT-15)

Given an operational four wheel drive transfer case and necessary tools and equipment, the learner will rebuild the transfer case according to manufacturer's specifications.

TASK

PT-16 Diagnosing drive line and rear end problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the drive line and rear end.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Drive line function
- b. Drive line construction
- c. Rear end function
- d. Rear end construction
- e. Interpreting noises

Provide Demonstration On:

- a. Diagnosing drive line problems by sight
- b. Diagnosing rear end problems by sound

Provide Practical Application On:

Developing a plan and locating a known problem in the drive line and rear end

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Georgia, "Servicing U-joints and Drive Shaft," slide set; "Replacing and Adjusting Taper-type Rear Axle Bearings," slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 241-1
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Dial indicator set
- c. Repair manual
- d. Troubleshooting chart

LAB HOURS	6
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CLASS HOURS	6
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EVALUATION

(PT-16)

- a. Given a malfunctioning vehicle drive line and rear end and necessary tools and equipment, the learner will formulate a troubleshooting plan and locate in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 32.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Bergwall, "The Automotive Differential Explained," filmstrip; "Drive Shaft and Universal Joints Explained," filmstrip

TASK

PT-17 Testing the automatic transmission

PERFORMANCE OBJECTIVE

Perform operational and pressure tests to determine internal condition of the transmission.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Principles of operation
- b. Component identification
- c. Operational checks
- d. Using the pressure gauge
- e. Fluid condition test
- f. Safety

Provide Demonstration On:

Testing the automatic transmission using pressure tests and the senses of smell, touch and sight.

Provide Practical Application On:

Performing an in-the-car transmission test and recording information

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Delmar, "Hydraulic Control," filmstrip
- b. Ford, "Transmission. Models C-3, C-4, C-6, JATCO, FMX and Auto Overdrive," transparencies

(Continued on back)

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Service manual and specifications
- c. Pressure gauge
- d. Vacuum gauge and pump
- e. Tachometer

LAB HOURS 10

CLASS HOURS 10

III-255

EVALUATION

(PT-17)

- a. Given a vehicle with automatic transmission and necessary tools and equipment, the learner will test the transmission and record information. All recording must be within 10% of known data.
- b. V'TECS, Automotive Mechanics, Task No. 67.

INSTRUCTIONAL MATERIALS

A/Vs:

- c. Bergwall, "The Automatic Transmission Explained," filmstrip
- d. Prentice-Hall, "Automatic Transmission Maintenance," filmstrip

TASK

PT-18 Inspecting and adjusting shift linkage

PERFORMANCE OBJECTIVE

Perform an automatic transmission linkage inspection and adjustment.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Linkage diagram
- b. Purpose of linkage movements
- c. Description of defective linkage
- d. Linkage specifications

Provide Demonstration On:

Inspecting and adjusting automatic transmission linkage with the use of sight and manipulation of tools and equipment

Provide Practical Application On:

Inspecting, evaluating and adjusting the automatic transmission linkage

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

Georgia, "Adjusting Linkage and Replacing or Adjusting Modulator," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 242-2
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools and equipment
- b. Service manual and specifications

LAB HOURS	4
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CLASS HOURS	1
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EVALUATION

(PT-18)

- a. Given a vehicle equipped with adjustable shifter linkage and necessary service manuals and tools and equipment, the student will make adjustments to manufacturer's recommended procedures and specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 55, 56, 57.

TASK

PT-19 Removing and replacing automatic transmission oil filter

PERFORMANCE OBJECTIVE

Remove and replace the transmission oil filter.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Transmission oil filter construction
- b. Transmission oil filter types
- c. Transmission oil filter operation
- d. When and why replace the filters

Provide Demonstration On:

- a. Transmission oil filter location
- b. Transmission oil filter removal
- c. Transmission oil filter inspection
- d. Transmission oil filter cleaning
- e. Transmission oil filter replacing

Provide Practical Application On:

- a. Locating transmission oil filter
 - b. Removing transmission oil filter
- (Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains

A/Vs:

- a. Prentice-Hall, "Automatic Transmission Maintenance," filmstrip
- b. Georgia, "Change Transmission Pump Screen," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 242-3
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Cleaning vat
- c. Shop manual
- d. Automatic transmission

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(PT-19)

- a. Given a vehicle with an automatic transmission and necessary tools and equipment, the learner will remove and replace the transmission oil filter according to manufacturer's specifications. Upon completion there must be no visible oil leaks.
- b. V'TECS, Automotive Mechanics, Task No. 72.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application

On:

- c. Inspecting transmission oil filter
- d. Cleaning transmission oil filter
- e. Replacing transmission oil filter

TASK

PT-20 Testing and adjusting the automatic transmission vacuum modulator

PERFORMANCE OBJECTIVE

Test and adjust the vacuum modulator.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Vacuum modulator location
- b. Vacuum modulator operation
- c. Vacuum systems
- d. Modulator adjustment

Provide Demonstration On:

- a. Locating modulator
- b. Testing modulator
- c. Testing vacuum supply system
- d. Adjusting modulator

Provide Practical Application On:

- a. Locating modulator
- b. Testing modulator
- c. Testing vacuum supply system
- d. Adjusting modulator

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains

A/Vs:

Georgia, "Adjusting Linkage and Replacing or Adjusting Modulator," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 242-2
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Twin post lift
- b. Vacuum gauge
- c. Hand tools
- d. Shop manual
- e. Vacuum modulator

LAB HOURS

4

CLASS HOURS

1

EVALUATION

(PT-20)

- a. Given a vehicle with automatic transmission and necessary tools and equipment, the learner will locate, test and adjust the vacuum modulator according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 56, 60.

TASK

PT-21 Removing and disassembling transmission

PERFORMANCE OBJECTIVE

Remove and disassemble transmission for internal parts inspection.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Tools and equipment usage
- b. Transmission oil drain
- c. Propeller shaft removal
- d. Removal and disassembly information
- e. Torque converter removal

Provide Demonstration On:

Removing and disassembling the automatic transmission by using tools and equipment and proper hand and body manipulation

Provide Practical Application On:

Performing removal and disassembly of the transmission

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Bergwall, "The Automatic Transmission Explained," filmstrip
- b. Prentice-Hall, "Servicing the Automatic Transmission," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Lift
- c. Transmission jack
- d. Drain pan
- e. Transmission work stand
- f. Slide hammers
- g. Clutch spring depresser
- h. Shop manual

LAB HOURS 20

CLASS HOURS 5

III-263

EVALUATION

(PT-21)

- a. Given a vehicle with an automatic transmission and necessary tools and equipment, the learner will abide by all safety rules and manufacturer's procedures to remove transmission and disassemble. The student will complete the task within 1½ flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 58, 68.

TASK

PT-22 Inspecting and reassembling transmission

PERFORMANCE OBJECTIVE

Inspect and reassemble a transmission.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Parts description and assembly order
- b. Measuring device usage
- c. Safety

Provide Demonstration On:

Inspection of parts by using measuring devices and sight

Provide Practical Application On:

Performing component inspection and transmission reassembly

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Georgia, "Testing and Overhauling a C-6 Ford Transmission," filmstrip
- b. Prentice-Hall, "Servicing the Automatic Transmission," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Units 271-1, 271-2, 271-3, 271-4, 271-5
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Dial indicator
- b. Foot and inch pound torque wrench
- c. Hand tools
- d. Shop manual

LAB HOURS 20

CLASS HOURS 5

III-265

EVALUATION

(PT-22)

- a. Given an automatic transmission in need of inspection and reassembly and access to the proper hand tools and equipment, the learner will perform an inspection to be sure that all parts and reassembly is according to manufacturer's specifications and within two times flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71.

TASK

PT-23 Testing transmission on bench

PERFORMANCE OBJECTIVE

Perform a transmission bench test to determine internal operation and condition.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Principles of operation
- b. Component identification
- c. Casing port hole routing
- d. Component engagement chart

Provide Demonstration On:

Testing the automatic transmission using compressed air, measuring devices and sight

Provide Practical Application On:

Performing bench test and recording information

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

Prentice-Hall, "Servicing the Automatic Transmission," film-strip

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Micrometer
- b. Dial indicator
- c. Snap ring pliers
- d. Hand tools
- e. Air nozzle with rubber end
- f. Transmission workstand
- g. Clutch spring depressor
- h. Slide hammer

LAB HOURS 10

CLASS HOURS 2

III-267

EVALUATION

(PT-23)

- a. Given an automotive transmission and necessary tools and equipment, the learner will bench test the transmission and record information. All recordings must be within 10% of known data.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

TASK

PT-24 Removing and replacing torque converter

PERFORMANCE OBJECTIVE

Remove, inspect and replace torque converter to restore proper operation.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Transmission removal
- b. Torque converter removal and inspection
- c. Seal replacing
- d. Torque converter installation
- e. Transmission installation

Provide Demonstration On:

Removing and replacing torque converter and seal

Provide Practical Application On:

Removing and replacing torque converter and front seal

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains;
Automotive Mechanics

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Seal puller and installer
- b. Hand tools
- c. Transmission removal tools
- d. Shop manual

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(PT-24)

- a. Given a vehicle with a defective converter and proper tools, equipment and service manuals, the learner will complete the task as recommended by the manufacturer. The repair must not cause damage to other parts and must be leak free.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 62.

TASK

PT-25 Diagnosing automatic transmission problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the automatic transmission.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Automatic transmission theory of operation
- b. Automatic transmission make up
- c. Determining problems by noise and action of transmission

Provide Demonstration On:

Diagnosing automatic transmission problems using shop manual troubleshooting chart

Provide Practical Application On:

Performing a transmission diagnosis using a troubleshooting plan

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse, Automotive Transmissions and Power Trains; Automotive Mechanics

A/Vs:

- a. Prentice-Hall, "Automatic Transmission Maintenance," filmstrip
- b. Ford, "Automatic Transmission Diagnosis," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 242-1
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Measuring device
- c. Specifications
- d. Shop repair manual
- e. Diagnosis chart

LAB HOURS	6
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CLASS HOURS	6
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EVALUATION

(PT-25)

- a. Given a vehicle equipped with an automatic transmission and necessary tools, equipment and data, the learner will develop a troubleshooting plan to locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

TASK

IC-01 Determining engine condition

PERFORMANCE OBJECTIVE

Determine engine condition and work required to restore to usable or like new condition.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Minor tune-up as troubleshooting tool
- b. Major tune-up as troubleshooting tool
- c. Compression and leakage tests as troubleshooting tool
- d. Road test or dynamometer as troubleshooting tool
- e. Significance of sounds, smoke and other visual clues to engine condition

Provide Demonstration On:

- a. Minor tune-up
- b. Major tune-up
- c. Compression and leakage test
- d. Dynamometer and/or road test if feasible
- e. Interpreting sounds, smoke, etc.

Provide Practical Application On:

Determining engine condition based on test data and recorded readings

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Crouse, Automotive Mechanics
- c. Dagel, Diesel Engine Repair

A/Vs:

Bergwall, "Problems of the Internal Combustion Engine Explained," filmstrip; "Internal Combustion Engine," filmstrip; "Ignition System," filmstrip; "How to do a Major Engine Tune-Up," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Units 223-12, 223-13
- b. Oklahoma, Auto Mechanics I, II

Tools and Equipment:

- a. Hand tools
- b. Ignition analyzer

(Continued on back)

LAB HOURS	8
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CLASS HOURS	6
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EVALUATION

(IC-01)

- a. Given an operational engine and necessary tools and equipment, the student will perform all necessary tests to determine the condition of the engine and what repair procedure is required to restore the engine to usable condition. Eighty percent accuracy of known conditions is required and a recommendation for engine rebuild must be supported by 100% accuracy in test data.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia, Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vol. II.
- d. V'TECS, Automotive Mechanics.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- c. Compression tester/leakage tester (gas and diesel)
- d. Dynamometer - if applicable
- e. Plugs, points, condenser wires or other defective tune-up needs
- f. Shop repair manual
- g. Vehicle or engine for testing

TASK

IC-02 Identifying cylinder head component parts

PERFORMANCE OBJECTIVE

Identify and provide a written description of the cylinder head component parts.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Valve size (exhaust and intake)
- b. Different kinds of valve seals
- c. Wear points (stem and guides)
- d. Different valve angles
- e. Valve interference angle
- f. Valve guides (replaceable and non-replaceable guides)

Provide Demonstration On:

Using each part as a visual aid and its description and function is explained

Provide Practical Application On:

Laying out parts and having learner identify and write a description and function

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Dagel, Diesel Engine Repair

A/Vs:

Bergwall, "The Internal Combustion Engine Explained," film-strip

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Cylinder head and all component parts (gas and diesel)
- b. Parts manual or microfiche

LAB HOURS 0

CLASS HOURS 2

EVALUATION

(IC-02)

- a. Given a disassembled cylinder head and all component parts displayed on table, the student will identify all parts by name and write a description and function of each. Seventy percent accuracy is required and correct nomenclature must be used.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vol. II.

TASK

IC-03 Adjusting the valves

PERFORMANCE OBJECTIVE

Adjust valves equipped with mechanical lifters and hydraulic lifters.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Difference between mechanical and hydraulic valve lifters
- b. Cold and hot adjustments
- c. Relationship of valve timing and adjustment positions
- d. The need for different clearances for intake valves and exhaust valves
- e. Importance of oiling for push rods, rocker arms and etc.
- f. Use of torque wrench
- g. Correct replacement of valve cover and gasket

Provide Demonstration On:

- a. Removing valve cover
- b. Use of feeler gauge
- c. Adjusting valves
- d. Replacing valve covers
- e. Checking for oil leaks

Provide Practical Application On:

Adjusting both mechanical lifters and hydraulic lifters

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Dagel, Diesel Engine Repair

A/Vs:

- a. Bergwall, "Internal Combustion Engine," filmstrip
- b. Georgia, "Adjusting Valves," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-17
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Vehicle suitable for task
- b. Tools common to task
- c. Gaskets
- d. Cleaning vat
- e. Shop manual

LAB HOURS 2

CLASS HOURS 1

III-277

EVALUATION

(IC-03)

- a. Given an automobile engine with non-adjusted hydraulic or mechanical valve lifters, tools and equipment, the student will adjust the valves to within .002" of manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 2.
- e. V'TECS, Diesel Mechanics, Task No. D-01.

TASK

IC-04 Removing the cylinder head(s)

PERFORMANCE OBJECTIVE

Remove the cylinder head(s) from an engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Removing vacuum hoses
- b. Removing emission control components
- c. Removing intake manifold
- d. Draining cooling system (radiator and block)
- e. Proper storing of parts as they are removed from vehicle
- f. Removing exhaust manifolds
- g. Removing and caring for injectors
- h. Removing push rods and rocker arms

Provide Demonstration On:

- a. Draining cooling system
- b. Removing component parts
- c. Removing cylinder heads

Provide Practical Application On:

Cylinder head removal on a V-6, V-8 or 6-cylinder engine

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Mechanic Fundamentals
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics, C-I

A/Vs:

- a. Prentice-Hall, "Automotive Engine Overhaul," filmstrip
- b. Bergwall, "Internal Combustion Engine," filmstrip

Tools and Equipment:

- a. Vehicle for performing task
- b. Tools common to task
- c. Cleaning vat
- d. Shop manual

LAB HOURS 3

CLASS HOURS 1

EVALUATION

(IC-04)

- a. Given a vehicle and necessary tools and equipment, the student will remove the cylinder head(s) in accordance with manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Diesel Mechanics, Task No. B-06.

TASK

IC-05 Removing and inspecting the valves

PERFORMANCE OBJECTIVE

Remove, clean and inspect the valves and component parts.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Proper names for all component parts
- b. Importance of replacing parts in same position
- c. Inspecting valve spring
- d. Height (free standing)
- e. Checking compression value of valve springs
- f. Checking valve seat width
- g. Checking valve stem and valve guides
- h. Cleaning and inspecting head, face, margin and stem

Provide Demonstration On:

- a. Measuring valve spring heights (free standing)
- b. Testing valve spring tension
- c. Checking valve stem and valve guide wear
- d. Using wire brush to clean

Provide Practical Application On:

Removing, cleaning and inspecting valves and parts from cylinder heads

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Dagel, Diesel Engine Repair

A/Vs:

- a. Prentice-Hall, "Cylinder Head Service," filmstrip
- b. Bergwall, "Internal Combustion Engine," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics

Tools and Equipment:

- a. Valve removal tool
- b. 12" ruler
- c. Valve spring measuring device (tension)
- d. Dial indicator
- e. Shop manual

LAB HOURS 1

CLASS HOURS 3

EVALUATION

(IC-05)

- a. Given an assembled cylinder head and tools and equipment, the student will remove, clean and inspect component parts and valves. The student must make recommendations for repairs. All parts not meeting minimum manufacturer's specifications must be identified.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Diesel Mechanics, Task No. B-07.

TASK

IC-06 Refacing the valves and valve stems

PERFORMANCE OBJECTIVE

Reface valves and valve stems.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Construction of valves
- b. Identifying angle of face and margin dimension
- c. Bent or worn valves
- d. Measurement of valve stem to valve guide
- e. Valve grinding equipment

Provide Demonstration On:

- a. Checking valve stems for wear
- b. Checking valves for warped stems
- c. Checking valve face for cracks, blisters and face margin
- d. Setting valve machine for proper angle of valve face
- e. Installing valve in chuck properly
- f. Setting micrometer
- g. Grinding face of valve and stem as per specifications

Provide Practical Application On:

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Mechanic Fundamentals

A/Vs:

- a. Georgia, "Grinding Valves and Chamfering Stems," slide set
- b. Sioux, "Reconditioning the Cylinder Head," movie film

(Continued on back)

Student Manuals:

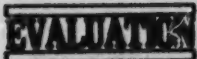
- a. Georgia, Auto Mechanics, Unit 211-6
- b. Oklahoma, Auto Mechanics II
- c. MAVCC, Diesel Engine Mechanics, C-1

Tools and Equipment:

(Continued on back)

LAB HOURS 4

CLASS HOURS 2



(IC-06)

- a. Given a set of valves with pitted or worn faces and stems, tools and equipment, the student will reface valves and stems to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vol. I, II.
- d. V'TECS, Automotive Mechanics, Task No. 8.
- e. V'TECS, Diesel Mechanics, Task No. B-04.

INSTRUCTIONAL MATERIALS

A/Vs:

- c. Bergwall, "How to Use a Valve and Valve Seat Refacer," filmstrip
- d. Prentice-Hall, "Cylinder Head Service," filmstrip

Tools and Equipment:

- a. Micrometer
- b. Valve machine
- c. Shop manual
- d. Prussian blue

TASK

IC-07 Inspecting the cylinder head

PERFORMANCE OBJECTIVE

Clean and inspect the cylinder head for warpage, cracks, blockage and valve seat wear.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Methods of cleaning the head
- b. Use of straight edge for determining warpage
- c. Liquid test for cracks
- d. Valve seat inspection
- e. Valve guide inspection

Provide Demonstration On:

- a. Procedure for using straight edge
- b. Liquid testing of cylinder head
- c. Cleaning head with drill motor and wire brushes
- d. Inspecting valve seats and guides

Provide Practical Application On:

Cleaning and inspecting the cylinder head for warpage, cracks, valve seat and guide condition

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Bagel, Diesel Engine Repair

A/Vs:

Bergwall, "How to Overhaul an Engine," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics, C-I

Tools and Equipment:

- a. Straight edge
- b. Feeler gauge
- c. Flat carbon scraper
- d. Cleaning vat
- e. Shop manual
- f. Spot check kit

LAB HOURS 1

CLASS HOURS 1

EVALUATION

(IC-07)

- a. Given a cylinder head of known condition and tools and equipment, the student will clean, check and test cylinder head. All known defects must be identified and evaluated according to the manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 11.
- e. V'TECS, Diesel Mechanics, Task No. A-01.

TASK

IC-08 Grinding the valve seats

PERFORMANCE OBJECTIVE

Grind valve seats in head as per manufacturer's specifications.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Cleaning valve seat and valve port
- b. Selecting dressing stones of correct size and texture
- c. Selecting correct valve guide pilot
- d. Lowering or raising valve seat face
- e. Using valve seat equipment
- f. Valve stone dressing stand

Provide Demonstration On:

- a. Dressing stone to proper degree
- b. Grinding valve seats with grinding motor
- c. Using dial indicator to measure valve seat concentricity

Provide Practical Application On:

Grinding valve seats to correct dimensions

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dager, Diesel Engine Repair

A/Vs:

- a. Georgia, "Reconditioning Valve Guides and Grinding Valve Seats," slide set
- b. Bergwall, "How to Use a Valve and Valve Seat Refacer," filmstrip
- c. Prentice-Hall, "Cylinder Head Service," filmstrip

Student Manuals:

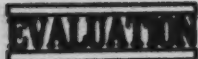
- a. Georgia, Auto Mechanics, Unit 211-7
- b. Oklahoma, Auto Mechanics II
- c. MAVCC, Diesel Engine Mechanics, C-I

Tools and Equipment:

(Continued on back)

LAB HOURS 4

CLASS HOURS 2



(IC-08)

- a. Given a cylinder head, tools and equipment, the student will resurface valve seats. All work must be within manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 28.
- e. V'TECS, Diesel Mechanics, Task No. B-02.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Valve seat grinding motor
- b. Valve grinding stones and pilot
- c. Dial indicator for measuring valve seat
- d. Shop manual
- e. Prussian blue or Diekem

TASK

IC-09 Servicing the rocker arm, push rod and lifter assemblies

PERFORMANCE OBJECTIVE

Service the rocker arm, push rod and lifter assemblies.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Inspecting rocker arm, studs or shaft assembly for wear
- b. Inspecting rocker push rod ball
- c. Inspecting push rod socket end
- d. Inspecting camshaft end of lifters
- e. Inspecting push rod end of lifters
- f. Inspecting ball swivel and rocker arm inner faces
- g. Testing hydraulic lifters

Provide Demonstration On:

- a. Inspecting all component parts of rocker arms and lifters
- b. Resurface lifter
- c. Resurface rocker arm pads
- d. Testing hydraulic lifters

Provide Practical Application On:

Inspecting and refacing lifters and rocker arms

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

Tools and Equipment:

- a. Valve grinding machine
- b. Shop manual

LAB HOURS 2

CLASS HOURS 2

EVALUATION

(IC-09)

- a. Given a set of rocker arms, push rods, lifter assemblies, tools and equipment, the student will inspect and determine usability of all components within manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 28.

TASK

IC-10 Reassembling and replacing the cylinder head(s)

PERFORMANCE OBJECTIVE

Reassembling and replacing the cylinder heads.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Lapping valves
- b. Installing valves, springs, seals and keepers
- c. Cleaning surface of block
- d. Cleaning cylinder head bolts and threads (block and bolts)
- e. Use of torque wrench
- f. Head tightening procedures
- g. Adjusting valves (hot and cold)

Provide Demonstration On:

- a. Lapping valves
- b. Reassembling cylinder head using same valves in valve ports they were removed from
- c. Installing gaskets and cylinder head as per manufacturer's specifications
- d. Tightening cylinder head bolts
- e. Replacing all other component parts
- f. Filling radiator
- g. Warming engine 20 to 30 minutes

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Assembling Cylinder Head and Valves," slide set
- b. Prentice-Hall, "Cylinder Head Service," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-8, 211-15
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

(Continued on back)

LAB HOURS 5

CLASS HOURS 1

EVALUATION

(IC-10)

- a. Given a cylinder head and all component parts, tools and equipment, the student will reassemble and install cylinder head(s) according to manufacturer's specifications. Upon completion, the compression must be within manufacturer's tolerances and have no occurrence of water leaks or exhaust leaks after completion of a road test.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

INSTRUCTIONAL ACTIVITIES

Provide Demonstration On:

- h. Adjusting valves
- i. Checking for oil and water leaks

Provide Practical Application On:

Reassembling and installing cylinder head

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Basic tool set
- b. Valve spring compressor
- c. Lapping tools and compound
- d. Torque wrench
- e. Vehicle from which cylinder head(s) have been removed

TASK

IC-11 Diagnosing problems in the valve train

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the valve train.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Detecting valve problems with vacuum gauge
- b. Checking valve problems with compression gauge or cylinder leak test
- c. Valve noise
- d. Oiling or component parts of valve train
- e. Valve adjustment procedure and clearance checks

Provide Demonstration On:

- a. Cylinder leak test or compression test
- b. Checking engine with vacuum gauge
- c. Checking valve noise with listening device

Provide Practical Application On:

- a. Locating an engine miss due to burned valves or defective valve train
- b. Locating source of valve train noise

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Troubleshooting and Diagnosing Engine Problems," filmstrip
- b. Bergwall, "The Internal Combustion Engine Explained," filmstrip
- c. Cummins, "Head and Valve Train Failure Analysis," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-20
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Tools common to task
- b. Cylinder test leaker
- c. Compression tester
- d. Stethoscope or other listening device

LAB HOURS 2

CLASS HOURS 2

EVALUATION

(IC-11)

- a. Given an operational engine with a valve train related to engine miss or noise, tools and equipment, the student will develop a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 5.

TASK

IC-12 Removing component parts

PERFORMANCE OBJECTIVE

Remove necessary parts to gain access to the vibration damper.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Determining what must be removed
- b. Removal procedures
- c. Care of painted surfaces
- d. Importance of marking parts for reassembly

Provide Demonstration On:

- a. Removing radiator
- b. Removing water and power steering pumps
- c. Marking braces or brackets

Provide Practical Application On:

Removing radiator, water pump and power steering pump

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Glenn, Auto Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

Tools and Equipment:

- a. Engine in chassis
- b. Shop manual
- c. Assorted hand tools
- d. Line wrench set

Student Manuals:

Oklahoma, Auto Mechanics II

LAB HOURS 5

CLASS HOURS 1

EVALUATION

(IC-12)

- a. Given a vehicle, the student will remove the necessary parts to gain access to the vibration damper without damage and in stated flat rate time.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vol. II.

TASK

IC-13 Removing vibration damper

PERFORMANCE OBJECTIVE

Remove a vibration damper from an engine mounted in a vehicle.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of pullers touse
- b. Special care in removing vibration damper
- c. Inspection of seal area of damper

Provide Demonstration On:

- a. How to attach puller
- b. Puller adapters for crankshaft

Provide Practical Application On:

Removing a vibration damper from an engine

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Glenn, Auto Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

Cummins, "Vibration Failure Analysis," slide set

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Engine in chassis
- b. Shop manual
- c. Assorted hand tools
- d. Puller

LAB HOURS 1

CLASS HOURS 1

EVALUATION

(IC-13)

- a. Given a vehicle, the student will use the correct puller to remove the vibration damper without damage and in stated flat rate time.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vol. II.

TASK

IC-14 Removing front cover

PERFORMANCE OBJECTIVE

Remove the time chain cover.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Front cover designs
- b. Steps in removal procedures
- c. Front cover inspection
- d. Removing old seals

Provide Demonstration On:

- a. Locating all cover bolts
- b. Cleaning cover
- c. Removing old seal

Provide Practical Application On:

Removing, cleaning and inspecting timing cover

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Glenn, Auto Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

Tools and Equipment:

- a. Engine in chassis
- b. Shop manual
- c. Assorted hand tools
- d. Punch or chisel

Student Manuals:

Oklahoma, Auto Mechanics II

LAB HOURS 1

CLASS HOURS 1

EVALUATION

(IC-14)

- a. Given a vehicle, the student will remove the front cover from the engine and inspect. This must be done within stated flat rate time and without damage to parts.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

IC-15 Removing and replacing timing chain(s) and/or gears

PERFORMANCE OBJECTIVE

Remove and replace the timing chain and gears.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Timing chain and gear arrangements
- b. Timing chain and gear removal
- c. Timing chain and gear alignment

Provide Demonstration On:

- a. Pulling gears
- b. Installing gears

Provide Practical Application On:

Removing and replacing timing chain gears

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Glenn, Auto Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

Georgia, "Installing Crankshaft and Timing Gear," slide set

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Engine in chassis
- b. Shop manual
- c. Assorted hand tools
- d. Torque wrench

LAB HOURS 5

CLASS HOURS 1

III-301



(IC-15)

- a. Given a vehicle, the student will remove and replace the timing chain and gears. Valve timing must meet manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

IC-16 Replacing front cover and seal

PERFORMANCE OBJECTIVE

Replace the front cover and seal.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Seals
- b. Seal installation
- c. Use of seal installation tools
- d. Using centering tool

Provide Demonstration On:

- a. How to use the seal installation tool
- b. How to use centering tool

Provide Practical Application On:

Installing seal in cover and reinstalling cover on engine

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Glenn, Auto Mechanics
- b. Dagel, Diesel Engine Repair

Student Manuals:

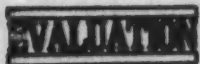
Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Engine in chassis
- b. Shop manual
- c. Assorted hand tools
- d. Seal installation kit
- e. Centering tool
- f. Torque wrench

LAB HOURS 1

CLASS HOURS 1



(IC-16)

- a. Given a vehicle, the student will install a new seal. No visible oil leaks will be present when the engine is run for fifteen minutes.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

IC-17 Diagnosing timing chain problems

PERFORMANCE OBJECTIVE

Formulate a plan for locating problems and their cause in the timing chain and gear train.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Timing chain inspection
- b. Timing gear inspection
- c. Backlash
- d. Reduced engine performance

Provide Demonstration On:

- a. Ways of checking backlash
- b. Gear inspection procedures
- c. Noises
- d. Checking valve timing

Provide Practical Application On:

Using the troubleshooting plan to locate a problem and its cause in a engine with a faulty timing chain and/or gears

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Glenn, Auto Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

Tools and Equipment:

- a. Engine in chassis
- b. Shop manual
- c. Assorted hand tools

Student Manuals:

Oklahoma, Auto Mechanics II

LAB HOURS 1

CLASS HOURS 1

III-305

EVALUATION

(IC-17)

- a. Given a vehicle with a faulty timing chain and/or gears, the student will describe a troubleshooting plan and locate the problem and cause. The plan must lead the student to the cause of the problem within established flat rate time.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

IC-18 Removing engine from vehicle

PERFORMANCE OBJECTIVE

Remove complete engine from vehicle.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Safety
- b. Draining radiator and block
- c. Removing component parts and accessories
- d. Storing all component parts

Provide Demonstration On:

- a. Use of engine lift
- b. Sealing component parts (air conditioning, power steering, etc.)

Provide Practical Application On:

Having learner remove a six or eight cylinder engine from vehicle

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Dagel, Diesel Engine Repair

A/Vs:

Georgia, "Removing Engine," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-3
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Vehicle
- b. Mechanics tools
- c. Engine lift
- d. Drain pans
- e. Storage space or bins
- f. Shop manual

LAB HOURS	4
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CLASS HOURS	2
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(IC-18)

- a. Given a vehicle with faulty engine, tools and equipment, the student will remove the engine from the vehicle without causing damage and within double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

TASK

IC-19 Removing and inspecting usable parts

PERFORMANCE OBJECTIVE

Remove and inspect usable parts.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Method of cleaning and inspecting all parts
- b. Cleaning solutions (toxic and caustic)
- c. Storing all parts
- d. Removing only necessary parts for short block replacement
- e. Inspecting usability of parts

Provide Demonstration On:

- a. Use of steam cleaner and cleaning vat
- b. Using vibration damper puller
- c. Parts inspection

Provide Practical Application On:

Removing only those parts necessary for short block replacement

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Dagel, Diesel Engine Repair

A/Vs:

- a. Bergwall, "The Internal Combustion Engine Explained," filmstrip
- b. Prentice-Hall, "Automobile Engine Overhaul," filmstrip
- c. Cummins, "Basic Skills - Disassembly and Assembly," slide set

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Engine
- b. Steam jenny
- c. Cleaning vat
- d. Storage bins
- e. Mechanics tools common to task
- f. Shop manual

LAB HOURS 7

CLASS-HOURS 1

III-309



(IC-19)

- a. Given an automotive engine, tools and equipment, the student will remove, clean and inspect all parts required for short block replacement. All parts not meeting manufacturer's specifications must be identified.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 3, 4.

TASK

IC-20 Assembling new and used parts on block assembly

PERFORMANCE OBJECTIVE

Assemble short block assembly using new and used parts.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Use of torque wrenches
- b. Use of gasket sealants
- c. Installing distributor
- d. Adjusting all belts
- e. Use of measuring tools
- f. Valve train adjustments
- g. Importance of pre-oiling

Provide Demonstration On:

- a. Use of torque wrench
- b. Belt tension gauge
- c. Installing distributor
- d. Adjusting valves
- e. Pre-oiling

Provide Practical Application On:

Having learner assemble short block assembly in preparation for installation

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Stockel, Auto Service and Repair
- b. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Installing Oil Pump, Manifold, Housing Covers and Accessories," slide set
- b. Prentice-Hall, "Automobile Engine Overhaul," filmstrip
- c. Cummins, "V-903 Engine Disassembly/Assembly," slide set

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-18
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Mechanics tools
- b. Torque wrench
- c. Belt tension gauge
- d. Shop manual

LAB HOURS 8

CLASS HOURS 4

EVALUATION

(IC-20)

- a. Given a short block, tools and equipment, the student will install necessary parts on short block assembly and make ready for installation in an automobile. All manufacturer's specifications must be met.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 12, 24, 25, 31, 32.

TASK

IC-21 Installing engine assembly

PERFORMANCE OBJECTIVE

Install engine and prepare for run-up test.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Use of engine hoist
- b. Aligning component parts
- c. Necessary adjustments
(linkage to carburetor
and transmission)
- d. Filling radiator
- e. Engine oil and filter

Provide Demonstration On:

- a. Use of engine hoist
- b. Filling radiator
- c. Checking transmission
linkage

Provide Practical Application On:

Installing engine assembly in
automobile

INSTRUCTIONAL MATERIALS

Textbooks:

Dagel, Diesel Engine Repair

A/Vs:

Georgia, "Installing Engine,"
slide set

Student Manuals:

- a. Georgia, Auto Mechanics,
Unit 211-19
- b. Oklahoma, Auto Mechanics
II

Tools and Equipment:

- a. Engine hoist
- b. Mechanics tools
- c. Transmission fluid or
grease

(Continued on back)

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(IC-21)

- a. Given an engine assembly and necessary tools and equipment, the student will install an engine. All connections and installations must meet manufacturer's specifications. All work must be done in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. Engine oil
- e. Anti-freeze
- f. Shop manual

TASK

IC-22 Testing engine assembly

PERFORMANCE OBJECTIVE

Test run engine and check for any problems caused by improper assembly or installation procedures.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Pre-oiling
- b. Initial start-up checks
- c. Monitoring oil pressure and temperature
- d. Running RPM

Provide Demonstration On:

- a. Pre-oiling
- b. Cranking and starting
- c. Setting RPM

Provide Practical Application On:

Having learner test run an engine (engine can be newly installed or set up)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

Bergwall, "How to Overhaul an Engine," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Pressure oiling tank
- b. Remote starter switch
- c. Tachometer
- d. Shop manual

LAB HOURS 1

CLASS HOURS 1

EVALUATION

(IC-22)

- a. Given a vehicle and necessary tools and equipment, the student will test run and make all operational checks. Performance checks must be the same as known conditions.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 17.

TASK

IC-23 Diagnosing internal engine problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating internal mechanical problems of the automotive engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Diagnostic equipment common to automotive trade
- b. Types and kinds of noises
- c. Oil and water leaks
- d. Performance of engine

Provide Demonstration On:

- a. Use of diagnostic equipment
- b. Locating problems by hearing, sight and touch

Provide Practical Application On:

Diagnosing bearing knocks, piston slap

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, The Auto Book
- b. Stockel, Auto Service and Repair
- c. Dagle, Diesel Engine Repair

A/Vs:

- a. Georgia, "Troubleshooting and Diagnosing Engine Problems," filmstrip
- b. Bergwall, "Problems of the Internal Combustion Engine Explained," filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-20
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Diagnostic equipment
- b. Shop manual

LAB HOURS 1

CLASS HOURS 3

EVALUATION (IC-23)

- a. Given a vehicle with internal engine problems and necessary tools and equipment, the student will develop a trouble-shooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- c. Cummins, "Lube Oil System - Introduction to Trouble-shooting," slide set;
"Oil Consumption Analysis," slide set

TASK

IC-24 Disassembling an internal combustion engine

PERFORMANCE OBJECTIVE

Disassemble complete engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Removing distributor
- b. Removing cylinder heads
- c. Removing harmonic balancer
- d. Removing remaining external components
- e. Removing internal components
- f. Removing cam bearings
- g. Importance of numbering rods, pistons and main bearing caps

Provide Demonstration On:

- a. Removing harmonic balancer
- b. Numbering rods, pistons and main bearing caps

Provide Practical Application On:

Completely disassemble automotive gas engine including removing cam bearings

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, The Auto Book
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Disassembling Engine (V-8 or 6-cylinder)," slide set; "Disassembling, Cleaning and Inspecting Engine," filmstrip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 211-1, 251-1
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Hand tools
- b. Safety glasses
- c. Puller
- d. Number stamp set
- e. Shop manual

LAB HOURS 11

CLASS HOURS 4

EVALUATION

(IC-24)

- a. Given an internal combustion engine, the student will completely disassemble engine without damage to parts. All parts must be identified and their functions must be described.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 6.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Prentice-Hall, "The Basic Engine," filmstrip; "Automobile Engine Overhaul," filmstrip
- c. Bergwall, "The Internal Combustion Engine Explained," filmstrip

TASK

IC-25 Cleaning and inspecting block and components

PERFORMANCE OBJECTIVE

Clean and inspect block and components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Steam cleaner use
- b. Parts cleaning techniques
- c. Gasket removal
- d. Parts inspection
- e. Measuring crankshaft and block for wear
- f. Checking water and oil galleries

Provide Demonstration On:

- a. Using steam cleaner
- b. Visual inspection
- c. Using micrometers to measure parts

Provide Practical Application On:

- a. Cleaning engine block and components
- b. Measuring cylinder and piston wear
- c. Measuring crankshaft
- d. Inspecting all components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Cleaning Engine and Engine Compartment," slide set; "Removing and Measuring Crankshaft and Camshaft," filmstrip/slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 211-4, 211-10
- b. Oklahoma, Auto Mechanics II
- c. Ford, Gasoline Engine-Repair Techniques

Tools and Equipment:

(Continued on back)

LAB HOURS 10

CLASS HOURS 5

III-321

EVALUATION

(IC-25)

- a. Given disassembled engine and necessary tools and equipment, the student will clean and inspect cylinder block and all component parts. All defective parts must be identified and all measurements must be within .002" of the instructor's readings.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task Nos. 3, 14.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Prentice-Hall, "Automobile Engine Overhaul," filmstrip
- c. Ford, "Gasoline Engines-Repair Techniques," film-strip
- d. Cummins, "Single Connecting Rod Bearing Failure," slide set

Tools and Equipment:

- a. Steam cleaner
- b. Parts cleaner
- c. Crankshaft and block
- d. Micrometers (inside and outside)
- e. Service manual

TASK

IC-26 Preparing cylinder block

PERFORMANCE OBJECTIVE

Remove ridge and hone cylinders.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Necessity of removing top ridge and honing cylinders
- b. Using ridge reamer and cylinder hone
- c. Safety while handling tools
- d. Cleaning after honing (hot water and soap)

Provide Demonstration On:

Removing ridge and honing cylinders

Provide Practical Application On:

Removing ridge and honing cylinders

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Servicing Cylinder Block," filmstrip
- b. Prentice-Hall, "Automobile Engine Overhaul," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-II
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Cylinder block
- b. Ridge reamer
- c. Cylinder hone and oil
- d. Service manual

LAB HOURS 8

CLASS HOURS 2

III-323

EVALUATION

(IC-26)

- a. Given a cylinder block and necessary tools and equipment, the student will cut the ridge out without damaging cylinder and hone the cylinder to form a cross hatch pattern as pictured in the textbook.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

IC-27 Installing cam bearings

PERFORMANCE OBJECTIVE

Install cam bearings in an engine block.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Cam bearings
- b. Cam bearing construction
- c. Installation tools
- d. Sequence of installation
- e. Oil hole alignment

Provide Demonstration On:

Installing cam bearings

Provide Practical Application On:

Installing cam bearings

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Bagel, Diesel Engine Repair

A/Vs:

Prentice-Hall, "Automobile Engine Overhaul," filmstrip

Student Manuals:

Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Engine block and camshaft
- b. Cam bearings
- c. Installation tool
- d. Service manual

LAB HOURS 4

CLASS HOURS 2

III-325

EVALUATION

(IC-27)

- a. Given an engine block, cam bearings and necessary tools and equipment, the student will replace cam bearings according to the manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 22.

TASK

IC-28 Installing piston pins and rings

PERFORMANCE OBJECTIVE

Fit pistons to rods and install piston rings.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Piston pin fit
- b. Installing pins
- c. Compression rings
- d. Oil rings
- e. Cleaning ring grooves
- f. Installing rings in proper order
- g. Ring end gap placement

Provide Demonstration On:

- a. Installing piston pins
- b. Cleaning ring grooves
- c. Installing rings

Provide Practical Application On:

- a. Installing pistons on rods and cleaning ring grooves
- b. Installing piston rings

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Removing and Servicing Pistons and Rods," slide set; "Measuring Cylinder Diameter and Crank Pins," slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 211-9, 251-3
- b. Oklahoma, Auto Mechanics II
- c. Ford, Gasoline Engines - Piston Ring Service

Tools and Equipment:

(Continued on back)

LAB HOURS	8
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CLASS HOURS	2
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III-327

EVALUATION

(IC-28)

- a. Given a set of pistons, rods, rings, necessary tools and equipment, the learner will fit pistons to rods and install piston rings without damage. The installation must be in accordance with the manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task Nos. 7, 26.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Prentice-Hall, "Automobile Engine Overhaul," filmstrip
- c. Ford, "Gasoline Engines - Piston Ring Service," filmstrip

Tools and Equipment:

- a. Ring groove cleaner
- b. Piston vise
- c. Pistons and rods
- d. Piston rings
- e. Service manual

TASK

IC-29 Installing the crankshaft

PERFORMANCE OBJECTIVE

Install main bearings and crankshaft.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Bearing construction
- b. Crankshaft construction
- c. Rear oil seal installation
- d. Bearing installation
- e. Pre-oiling bearings
- f. Installing crankshaft
- g. Replacing main bearing caps in correct order
- h. Importance of torquing cap screws

Provide Demonstration On:

- a. Bearing, seal and crankshaft installation
- b. Torquing cap screws

Provide Practical Application On:

- a. Installing main bearings, seal and crankshaft
- b. Torquing to correct specifications

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Installing Crankshaft and Rear Oil Seal," slide set; "Installing Crankshaft and Timing Glass," slide set

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 211-12, 211-13
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

- a. Engine block
- b. Crankshaft, bearings and seals
- c. Hand tools
- d. Torque
- e. Service manual

LAB HOURS 6

CLASS HOURS 1

EVALUATION

(IC-29)

- a. Given an engine block, crankshaft, bearings, seals, necessary tools and equipment, the student will install the crankshaft and bearings. Upon completion, the shaft must turn freely and the main bearing cap torque must be within the manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 9.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Prentice-Hall, "Automobile Engine Overhaul," filmstrip
- c. Cummins, "Analysis and Prevention of Bearing Failure," slide set

TASK

IC-30 Installing liners, pistons and rod bearings

PERFORMANCE OBJECTIVE

Install liners, pistons and rod bearings.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Rod bearing construction
- b. Correct alignment of ring end gaps
- c. Proper positioning of pistons and rods
- d. Aligning numbering on rods and marks on piston crown
- e. Piston ring compressors
- f. Pre-lubrication of piston, block and rings
- g. Torquing rod bolts

Provide Demonstration On:

Installing pistons and connecting rod

Provide Practical Application On:

- a. Installing pistons and connecting rod
- b. Torquing connecting rod

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 211-14
- b. Oklahoma, Auto Mechanics II

A/Vs:

- a. Georgia, "Installing Pistons and Rod Assemblies," slide set
- b. Cummins, "Pistons and Liners Failure Analysis," slide set; "Bearing Failure Analysis," slide set

Tools and Equipment:

(Continued on back)

LAB HOURS 8

CLASS HOURS 2

III-331

EVALUATION

(IC-30)

- a. Given an engine block and pistons with rods, liners and necessary tools and equipment, the student will install pistons, liners and rods without damage and in accordance with manufacturer's specifications. The engine crankshaft must turn over smoothly without binding.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task No. 19.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Engine block, pistons, rod bearings
- b. Piston ring compressor
- c. Oil
- d. Hand tools
- e. Torque wrench
- f. Service manual

TASK

IC-31 Installing oil pump, oil pan and component parts

PERFORMANCE OBJECTIVE

Assemble remaining parts of an engine including oil pump, oil pan, etc.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Pre-oiling pump
- b. Oil pump construction
- c. Oil pump screen
- d. Oil pan and gasket
- e. Installation of all remaining components
- f. Importance of torquing

Provide Demonstration On:

Installation of oil pump

Provide Practical Application On:

Completing total assembly of an engine

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse, Automotive Mechanics
- b. Stockel, Auto Service and Repair
- c. Dagel, Diesel Engine Repair

A/Vs:

- a. Georgia, "Assembling Engine (V-8 or 6-cylinder)," slide set; "Installing Oil Pump, Pan, Manifold, Housing Covers and Accessories," slide set
- b. Prentice-Hall, "Automobile Engine Overhaul," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Units 211-2, 211-18
- b. Oklahoma, Auto Mechanics II

Tools and Equipment:

(Continued on back)

LAB HOURS	16
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CLASS HOURS	4
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EVALUATION

(IC-31)

- a. Given an engine with crankshaft and pistons installed, the learner will complete the assembly in double the flat rate time in accordance with the manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.
- d. V'TECS, Automotive Mechanics, Task Nos. 12, 21, 24, 25.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Partially assembled engine
- b. Remaining parts
- c. Hand tools
- d. Torque wrench
- e. Service manual

TASK

GS-01 Adjusting fuel/air mixtures and mechanical linkage

PERFORMANCE OBJECTIVE

Adjust fuel/air mixtures and carburetor linkage.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Fuels
- b. Carburetion principles
- c. Instrumentation

Provide Demonstration On:

- a. Adjusting carburetor
- b. Types of linkage

Provide Practical Application On:

- a. Adjusting carburetor manual type transmission
- b. Adjusting carburetor on automatic type transmission
- c. Adjusting carburetor with cruise control unit

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Mechanic Fundamentals

A/Vs:

- a. Bergwall, "The Operation of the Fuel System Explained," filmstrip
- b. Ford, "Fuel and Carburetion," filmstrip/tape

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. Ford, Fuel and Carburetion, Student Text

Tools and Equipment:

- a. Hand tools
- b. Dwell tach
- c. Manufacturer's repair manual or auto shop repair manual

LAB HOURS 1

CLASS HOURS 1

III-335

EVALUATION

(GS-01)

- a. Given an operational gasoline engine and necessary tools and equipment, the learner will adjust fuel/air mixtures to standards of the auto shop repair manual. The learner will adjust mechanical linkage to allow full opening and closing of the throttle with no binding.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 108, 115.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

GS-02 Cleaning or replacing fuel and air filters

PERFORMANCE OBJECTIVE

Clean or replace fuel and air filters as required.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Fuels
- b. Carburetion
- c. Filters

Provide Demonstration On:

- a. Replacing fuel and air filters
- b. Cleaning fuel and air filters

Provide Practical Application On:

- a. Cleaning fuel and air filters
- b. Replacing air filters
- c. Replacing in-line fuel filters
- d. Replacing carburetor fuel filters

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Auto-motive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Mechanic Fundamentals
- c. Kates, Diesel and High Compression Gas Engines
- d. Dagel, Diesel Engine Repair

A/Vs:

(Continued on back)

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. Georgia, Auto Mechanics, Unit 213-10
- c. MAVCC, Diesel Engine Mechanics, D-3, E-1

Tools and Equipment:

- a. Hand tools
- b. Air filter tester or drop-light

LAB HOURS 1

CLASS HOURS 1

III-337

EVALUATION

(GS-02)

- a. Given an operational gas engine and necessary tools and equipment, the learner will clean and/or replace the fuel and air filters according to manufacturer's specifications.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 112, 113, 116.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Bergwall, "The Operation of the Fuel System Explained," filmstrip
- b. Georgia, "Servicing Carburetor Air Cleaner," slide set/tape

TASK

GS-03 Removing carburetor from engine

PERFORMANCE OBJECTIVE

Remove carburetor from engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

Carburetion

Provide Demonstration On:

Removing carburetor

Provide Practical Application On:

- a. Removing 2BBL carburetor
- b. Removing 4BBL carburetor

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Auto-motive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Mechanic Fundamentals

A/Vs:

Ford, "Carburetor Two and Four Venturi," transparencies

Student Manuals:

Oklahoma, Auto Mechanics I

Tools and Equipment:

Hand tools

LAB HOURS 2

CLASS HOURS 1

III-339

EVALUATION

(GS-03)

- a. Given an operational gas engine and necessary tools and equipment, the learner will remove a 2BBL and a 4BBL carburetor from the engine. The learner will mark all vacuum hoses for later identification purposes.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Oklahoma, Auto Mechanics I.

TASK

GS-04 Disassembling, cleaning and inspecting carburetor

PERFORMANCE OBJECTIVE

Disassemble, clean and inspect carburetor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Carburetion
- b. Carburetor circuits
- c. Carburetor cleaning fluid

Provide Demonstration On:

- a. Carburetor disassembly
- b. Carburetor cleaning
- c. Carburetor inspection

Provide Practical Application On:

- a. Disassembling 2BBL and 4-BBL carburetor
- b. Cleaning 2BBL and 4BBL carburetor
- c. Inspecting 2BBL and 4BBL carburetor

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Service and Repair

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Units 213-3, 4, 5, 6, 7
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Carburetor repair tools
- c. Auto shop repair manual

LAB HOURS 4

CLASS HOURS 2

III-341

EVALUATION

(GS-04)

- a. Given a 2BBL or 4BBL carburetor and necessary tools and equipment, the learner will disassemble, clean and inspect the carburetor parts according to standards of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 111.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- a. Georgia, "Overhauling a Single Barrel Rochester Carburetor," slide set
- b. Bergwall, "The Operation of the Fuel System Explained," filmstrip
- c. Ford, "Carburetor Service," slide set
- d. Prentice-Hall, "Fuel Service," filmstrip

TASK

GS-05 Reassembling and testing carburetor

PERFORMANCE OBJECTIVE

Reassemble and test carburetor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Carburetion
- b. Carburetor circuits
- c. Carburetor gauge tools
- d. Instrumentation

Provide Demonstration On:

- a. Carburetor assembly
- b. Carburetor circuits adjustment
- c. Carburetor installation
- d. Instrument test

Provide Practical Application On:

- a. Assembling 2BBL and 4BBL carburetor
- b. Carburetor circuit adjustment
- c. Carburetor installation
- d. Instrument testing

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Service and Repair

A/Vs:

Bergwall, "How to Overhaul a Carburetor," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Units 213-3, 4, 5, 6, 7
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Carburetor repair tools
- c. Dwell tach
- d. Auto shop repair manual

LAB HOURS 6

CLASS HOURS 4

III-343

EVALUATION

(GS-05)

- a. Given a 2BBL or 4BBL carburetor, an operational engine and necessary tools and equipment, the learner will assemble the carburetor according to standards of the auto shop repair manual. The learner will install the carburetor on the engine and make necessary adjustments to meet manufacturer standards.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 118.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

GS-06 Testing and replacing fuel pumps

PERFORMANCE OBJECTIVE

Test and replace fuel pump.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Fuel systems
- b. Fuel pumps
 - 1. Vane
 - 2. Gear
 - 3. Reciprocating
- c. Fuel lines

Provide Demonstration On:

- a. Using a fuel pump pressure gauge
- b. Using a fuel pump flow meter
- c. Replacing manual fuel pump
- d. Replacing electric fuel pump

Provide Practical Application On:

- a. Using a fuel pump pressure gauge
- b. Using a fuel pump flow meter
- c. Replacing manual fuel pump
- d. Replacing electric fuel pump

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Service and Repair

A/Vs:

- a. Georgia, "Testing or Replacing Fuel Pumps" slide set
- b. Bergwall, "The Operation of the Fuel System Explained," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 213-2
- b. Oklahoma, Auto Mechanics I

Tools and Equipment:

- a. Hand tools
- b. Pressure gauge
- c. Flow meter

LAB HOURS 3

CLASS HOURS 1

III-345

EVALUATION

(GS-06)

- a. Given an operational fuel system and necessary tools and equipment, the learner will test and/or replace the fuel pump according to standards of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 112, 122.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

GS-07 Servicing fuel tank, lines, hoses and fuel level monitoring devices

PERFORMANCE OBJECTIVE

Service fuel tank, lines, hoses and fuel level monitoring devices.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Fuel systems
- b. Fuel lines
- c. Fuel gauges
- d. Volt-ohmmeter

Provide Demonstration On:

- a. Removal and service of fuel tank
- b. Servicing fuel gauge dash unit
- c. Servicing fuel gauge tank

Provide Practical Application On:

- a. Removing and servicing fuel tank
- b. Removing and servicing dash unit fuel gauge
- c. Removing and servicing tank sending unit

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Service and Repair

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 213-I
- b. Oklahoma, Auto Mechanics I
- c. MAVCC, Diesel Engine Mechanics, E-I

A/Vs:

- a. Georgia, "Auto Mechanics," slide set
- b. Bergwall, "The Operation of the Fuel System Explained," filmstrip

LAB HOURS 2

CLASS HOURS 1

III-347

EVALUATION

(GS-07)

- a. Given an operational fuel system and necessary tools and equipment, the learner will service and test the fuel tank, lines and hoses. The learner will also service and test the dash gauge unit and the tank gauge unit according to standard of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 109, 117, 123.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

GS-08 Diagnosing fuel system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the fuel system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Fuels
- b. Carburetion
- c. Instrumentation
- d. Filters
- e. Carburetor circuits

Provide Demonstration On:

- a. Carburetor with low or high float
- b. Clogged fuel filter
- c. Maladjusted air/fuel mixture
- d. Improper or nonfunctional fuel pump
- e. Maladjusted accelerator pump

Provide Practical Application On:

- a. Location of carburetor low or high float level
- b. Locating clogged fuel filter

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Fuel, Lubricating and Cooling Systems
- b. Stockel, Auto Service and Repair

A/Vs:

Bergwall, "The Operation of the Fuel System Explained," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics I
- b. Ford, Carburetor Diagnosis, Student Text
- c. MAVCC, Diesel Engine Mechanics, G-11

Tools and Equipment:

- a. Hand tools
- b. Dwell tach

(Continued on back)

LAB HOURS 2

CLASS HOURS 2

III-349

EVALUATION

(GS-08)

- a. Given an operational gas engine with an inoperative fuel system and necessary tools and equipment, the learner will develop a troubleshooting plan and determine the cause of the problem within double the standard flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application On:

- c. Determining maladjusted air/fuel mixture
- d. Determining improper or non-functional fuel pump
- e. Determining maladjusted accelerator pump

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- c. Carburetor repair tools
- d. Pressure gauge
- e. Volt-ohmmeter
- f. Auto shop repair manual

TASK

GS-09 Inspecting, selecting and installing spark plugs

PERFORMANCE OBJECTIVE

Inspect, select and install spark plugs.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Ignition secondary circuit
- b. Spark plugs
- c. Instrumentation

Provide Demonstration On:

- a. Spark plug removal/
installation
- b. Spark plug construction
- c. Effects of wrong spark
plug range
- d. Spark plug selection

Provide Practical Application On:

- a. Spark plug removal
- b. Spark plug selection by
engine type and plug
heat range
- c. Spark plug installation

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Auto-
motive Tune-Up
- b. Wetzel, Automotive Diag-
nosis and Tune-Up

A/Vs:

- a. Georgia, "Auto Mechan-
ics," slide set
- b. Bergwall, "The Ignition
System Explained," film-
strip
- c. Prentice-Hall, "Electrical
Ignition Service," film-
strip

Student Manuals:

- a. Georgia, Auto Mechanics,
Unit 223-9
- b. Oklahoma, Auto Mechanics
II
- c. MAVCC, Diesel Engine Me-
chanics, F-IV

Tools and Equipment:

- a. Hand tools

(Continued on back)

LAB HOURS 2

CLASS HOURS 1

III-351

EVALUATION

(GS-09)

- a. Given an operational gas engine and necessary tools and equipment, the learner will remove, select and install spark plugs according to standards of the auto shop repair manual.
- b. Hughes, Guide to Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 78.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- b. Dwell tach
- c. Spark plug gapping tool
- d. Spark plug cleaner/tester
- e. Auto shop manual

TASK

GS-10 Timing the ignition

PERFORMANCE OBJECTIVE

Time the ignition spark to piston travel.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Ignition system
- b. Instrumentation
- c. Timing requirements

Provide Demonstration On:

- a. Using dwell tach
- b. Using timing light
- c. Timing the ignition

Provide Practical Application On:

- a. Using dwell tach meter
- b. Using timing light
- c. Timing the ignition

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tune-Up
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Mechanics Fundamentals

A/Vs:

Bergwall, "The Ignition System Explained," filmstrip

Student Manuals:

- a. Oklahoma, Auto Mechanics II
- b. MAVCC, Diesel Engine Mechanics, F-IV

Tools and Equipment:

- a. Hand tools
- b. Dwell tach
- c. Volt-ohmmeter
- d. Auto shop repair manual

LAB HOURS 3

CLASS HOURS 1

III-353

EVALUATION

(GS-10)

- a. Given an operational engine and necessary tools and equipment, the learner will set the timing within one degree of specification of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 103.

TASK

GS-11 Inspecting and replacing ignition circuit wiring, distributor cap and rotor

PERFORMANCE OBJECTIVE

Inspect and replace primary and secondary wiring, distributor cap and rotor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Ignition system
- b. Secondary ignition circuit
- c. Distributor cap and rotor
- d. Engine firing orders

Provide Demonstration On:

- a. Replacing circuit wiring
- b. Replacing distributor cap and rotor
- c. Testing circuit wiring

Provide Practical Application On:

- a. Replacing circuit wiring
- b. Replacing distributor cap and rotor
- c. Testing circuit wiring

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tune-Up
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Mechanics Fundamentals

A/Vs:

- a. Georgia, "Auto Mechanics," slide set
- b. Bergwall, "The Ignition System Explained," film-strip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 223-8
- b. Oklahoma, Auto Mechanics II
- c. MAVCC, Diesel Engine Mechanics, F-IV

Tools and Equipment:

- a. Hand tools

(Continued on back)

LAB HOURS 3

CLASS HOURS 1

III-355

EVALUATION

(GS-11)

- a. Given an operational gas engine and necessary tools and equipment, the learner will inspect, test and replace circuit wiring, distributor cap and rotor according to specifications of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 80.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- b. Dwell tach
- c. Volt-ohmmeter
- d. Auto shop repair manual

TASK

GS-12 Testing, removing and replacing battery ignition components

PERFORMANCE OBJECTIVE

Test, remove and replace the breaker points, condenser and ignition coil.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Ignition breaker points
- b. Ignition condenser
- c. Ignition coil
- d. Ignition wire coil to points
- e. Breaker plate
- f. Instrumentation

Provide Demonstration On:

- a. Replacing breaker points
- b. Testing coil and condenser
- c. Testing coil wire to points
- d. Inspecting/replacing breaker plate

Provide Practical Application On:

- a. Replacing and setting breaker points
- b. Testing/replacing condenser
- c. Testing/replacing coil
- d. Testing/replacing ignition wire coil to points
- e. Inspecting/replacing breaker plate

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tune-Up
- b. Wetzel, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Service and Repair

A/Vs:

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 223-I0
- b. Ford, Ignition Systems
- c. Oklahoma, Auto Mechanics II
- d. MAVCC, Diesel Engine Mechanics, F-IV

Tools and Equipment:

(Continued on back)

LAB HOURS 4

CLASS HOURS 2

EVALUATION

(GS-12)

- a. Given an operational gas engine and necessary tools and equipment, the learner will test, inspect, remove and replace battery ignition components according to specifications of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task Nos. 81, 82, 96, 99, 100.
- d. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS:

A/Vs:

- a. Georgia, "Testing Ignition Coil," slide set
- b. Ford, "Ignition Systems," slide set; "Ignition System Principles of Operation," filmstrip
- c. Bergwall, "How to Do a Major Tune-Up," filmstrip; "Ignition System Explained," filmstrip
- d. Prentice-Hall, "Electrical Ignition Service," filmstrip

Tools and Equipment:

- a. Hand tools
- b. Dwell tach
- c. Coil condenser tester
- d. Volt-ohmmeter
- e. Auto Shop repair manual

TASK

GS-13 Testing, removing and replacing electronic ignition components

PERFORMANCE OBJECTIVE

Test, remove and replace electronic ignition components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Point-controlled
- b. Magnetic pulse or breakerless
- c. Photoelectric cell
- d. Light-emitting diode
- e. Capacitor discharge

Provide Demonstration On:

- a. Testing, removing and replacing components point-controlled
- b. Testing, removing and replacing magnetic-pulse or breakerless
- c. Testing, removing and replacing photoelectric cell
- d. Testing, removing and replacing light-emitting diode
- e. Testing, removing and replacing capacitor discharge

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tune-Up
- b. Johnson, Automotive Diagnosis and Tune-Up

A/Vs:

- a. Bergwall, "Electronic Ignition Explained," filmstrip
- b. Ford, "Solid State Ignition Systems," slide set
- c. Georgia, "Testing and Servicing Transistor Ignition System," filmstrip

Student Manuals:

- a. Ford, Solid State Ignition Systems
- b. Georgia, Auto Mechanics, Unit 262-4
- c. Oklahoma, Auto Mechanics II
- d. MAVCC, Diesel Engine Mechanics, F-IV

Tools and Equipment:

(Continued on back)

LAB HOURS 8

CLASS HOURS 2

EVALUATION

(GS-13)

- a. Given an operational gas engine containing one of the five major electronic ignition systems, necessary tools and equipment, the learner will identify the system and test, remove and replace electronic ignition components according to specifications of the auto shop repair manual.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. V'TECS, Automotive Mechanics, Task No. 107.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application On:

- a. Testing, removing and replacing components in point-controlled
- b. Testing, removing and replacing components in magnetic-pulse or breakerless
- c. Testing, removing and replacing components in photoelectric cell
- d. Testing, removing and replacing components in light-emitting diode
- e. Testing, removing and replacing components in capacitor discharge

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- a. Hand tools
- b. Dwell tach
- c. Voltmeter
- d. Ammeter
- e. Ohmmeter
- f. Auto shop manual

TASK

GS-14 Using and interpreting the ignition analyzer

PERFORMANCE OBJECTIVE

Hook-up and interpret the ignition analyzer (scope).

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Initial set up and lead connections
- b. Interpreting scope patterns
- c. Programming scope controls
- d. Meter usage

Provide Demonstration On:

- a. Setting up and testing lead connections
- b. Standard ignition testing
- c. Electronic ignition testing
- d. Meter and gauge testing

Provide Practical Application On:

- a. Initial set up and testing lead connections
- b. Testing standard ignition
- c. Testing electronic ignition
- d. Meter and gauge testing

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tune-Up
- b. Sun, Ignition Analyses Handbook
- c. Stockel, Auto Service and Repair

A/Vs:

- a. Georgia, "Performing On-Car Fuel System Tests and Adjustments," slide set

(Continued on back)

Student Manuals:

Georgia, Auto Mechanics, Unit 223-12

Tools and Equipment:

- a. Hand tools
- b. Tune-up ignition analyzer
- c. Auto shop repair manual

LAB HOURS 8

CLASS HOURS 2

III-361

EVALUATION

(GS-14)

- a. Given an ignition analyzer, operational gas engine and necessary tools and equipment, the learner will set up, use and test the ignition system. The analyzer recorded readings must be within 5% of actual known values.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.

INSTRUCTIONAL MATERIALS

A/V:

- b. Bergwall, "The Ignition System Explained," film-strip
- c. Ford, "Ignition System Diagnosis and Adjustment," transparencies

Tools and Equipment:

- a. Hand tools
- b. Tune-up ignition analyzer
- c. Auto shop repair manual

TASK

GS-15 Diagnosing ignition system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the ignition system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Ignition system (conventional)
- b. Ignition system (electronic)
- c. Instrumentation

Provide Demonstration On:

- a. Diagnosing problems in ignition system (conventional)
- b. Diagnosing problems in ignition system (electronic)
- c. Using instruments to diagnose ignition system problems

Provide Practical Application On:

- a. Diagnosing problems in ignition system (electronic)

(Continued on back)

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Tune-Up
- b. Sun, Ignition Analyses Handbook
- c. Stockel, Auto Service and Repair

Tools and Equipment:

- a. Hand tools
- b. Tune-up ignition analyzer
- c. Hand held meters
- d. Auto shop repair manual

A/Vs:

- a. Bergwall, "The Ignition System Explained," filmstrip
- b. Prentice-Hall, "Electrical Ignition Service," filmstrip; "Electronic Ignition Systems," filmstrip

LAB HOURS 3

CLASS HOURS 1

III-363

EVALUATION

(GS-15)

- a. Given an operational gas engine with faulty ignition system and necessary tools and equipment, the learner will formulate a troubleshooting plan and locate the problem in double the flat rate time.
- b. Hughes, Guide to the Automobile Mechanic Certification Exam.
- c. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application On:

- b. Diagnosing problems in ignition system (electronic)
- c. Using instruments to diagnose ignition system problems

TASK

GS-16 Measuring exhaust emissions

PERFORMANCE OBJECTIVE

Use the analyzer to measure exhaust emissions.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Infrared analyzer
- b. Analyzer components
- c. Operation principles

Provide Demonstration On:

- a. Setting up infrared analyzer
- b. Operating infrared analyzer
- c. Measuring exhaust emissions

Provide Practical Application On:

- a. Setting up infrared analyzer
- b. Operating infrared analyzer
- c. Measuring and recording exhaust emissions on two or more automobiles

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

- a. Georgia, "Testing and Servicing Emission Control System," slide set
- b. Bergwall, "Infrared Exhaust Analyzer," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-12
- b. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools
- b. Infrared analyzer
- c. Auto shop repair manual

LAB HOURS 3

CLASS HOURS 1

III-365

EVALUATION

(GS-16)

- a. Given an operational gas engine and necessary tools and equipment, the learner will measure and record exhaust emissions. Recorded readings must be within 5% of known values.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

TASK

GS-17 Testing and replacing components in the positive crankcase ventilation (PCV) system

PERFORMANCE OBJECTIVE

Test and replace components in the positive crankcase ventilation (PCV) system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. PCV system function
- b. PCV system components and function

Provide Demonstration On:

- a. Testing PCV system components
- b. Replacing PCV system components

Provide Practical Application On:

- a. Testing PCV system components
- b. Replacing PCV system components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Stockel, Auto Service and Repair

Student Manuals:

Georgia, Auto Mechanics, Unit 262-14

Tools and Equipment:

- a. Hand tools
- b. Tachometer
- c. Inclined ramp and ball PCV tester
- d. Adjustable PCV tester
- e. PCV valves
- f. Auto shop repair manual

LAB HOURS 1

CLASS HOURS 1

III-367

EVALUATION

(GS-17)

- a. Given an operational gas engine with PCV emissions system and necessary tools and equipment, the learner will test and replace the components in the PCV system according to standards in the auto shop repair manual or the manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanic, Vols. I and II.
- c. V'TECS, Automotive Mechanics, Task No. 16.

TASK

GS-18 Testing and replacing components in the fuel evaporative control system

PERFORMANCE OBJECTIVE

Test and replace components in the fuel evaporative control system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Fuel evaporative control function
- b. Fuel evaporative control components
- c. Fuel evaporative components and function

Provide Demonstration On:

- a. Testing fuel evaporative control components
- b. Replacing fuel evaporative control components

Provide Practical Application On:

- a. Testing fuel evaporative control components
- b. Replacing fuel evaporative control components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

Bergwall, "Automotive Pollution Control," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-I7
- b. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools
- b. Hoist
- c. Emission tester
- d. Tachometer
- e. Auto shop repair manual

LAB HOURS 3

CLASS HOURS 1

III-369

EVALUATION

(GS-18)

- a. Given an operational gas engine with fuel evaporative control system and necessary tools and equipment, the learner will test and replace the system components according to standards of the auto shop repair manual or manufacturer's specifications.
- b. MAVCC, Automotive Mechanics, Task No. 121.

TASK

GS-19 Testing and replacing components in the exhaust gas recirculation (EGR) system

PERFORMANCE OBJECTIVE

Test and replace components in the exhaust gas recirculation (EGR) system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. EGR system function
- b. EGR components
- c. EGR components function

Provide Demonstration On:

- a. Testing exhaust gas recirculation system components
- b. Replacing exhaust gas recirculation system components

Provide Practical Application On:

Testing and replacing exhaust gas recirculation system components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

Bergwall, "Automotive Pollution Control," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-18
- b. Ford, Exhaust Gas Recirculation Systems
- c. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools

(Continued on back)

LAB HOURS 2

CLASS HOURS 2

EVALUATION

(GS-19)

- a. Given an operational engine with EGR emissions system and necessary tools and equipment, the learner will test and replace the system components according to standards of the auto shop repair manual or manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- b. Vacuum gauge
- c. Tachometer
- d. Hand vacuum pump
- e. Shop repair manual

TASK

GS-20 Testing and replacing the catalytic converter

PERFORMANCE OBJECTIVE

Test, remove and replace the catalytic converter.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Catalytic converter construction
- b. Catalytic converter function

Provide Demonstration On:

- a. Testing a catalytic converter
- b. Replacing a catalytic converter

Provide Practical Application On:

Testing and replacing catalytic converter

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

Bergwall, "Automotive Pollution Control," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-20
- b. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools
- b. Emissions tester
- c. Tachometer

(Continued on back)

LAB HOURS 3

CLASS HOURS 1

EVALUATION

(GS-20)

- a. Given an operational gas engine with catalytic converter system and necessary tools and equipment, the learner will test and replace the converter to standards in the auto shop repair manual or manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. Hoist
- e. Catalytic converter cut-a-way
- f. Shop repair manual

TASK

GS-21 Testing and replacing components in the thermostatic air cleaner (TAC) system

PERFORMANCE OBJECTIVE

Test and replace components in the thermostatic air cleaner system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. TAC system function
- b. TAC components
- c. TAC components function

Provide Demonstration On:

- a. Testing TAC system components
- b. Replacing TAC system components

Provide Practical Application On:

Testing and replacing TAC system components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

- a. Prentice-Hall, "Servicing Ford and General Motors Control Systems," film-strip

(Continued on back)

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-15
- b. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools
- b. Pan for water and heat source

(Continued on back)

LAB HOURS 2

CLASS HOURS 2

III-375

EVALUATION

(GS-21)

- a. Given an operational engine with TAC emissions system and necessary tools and equipment, the learner will test and replace components of the system according to standards in the auto shop repair manual or manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Bergwall, "Automotive Pollution Control," film-strip

Tools and Equipment:

- c. Thermometer
- d. Vacuum gauge and hand vacuum pump
- e. Tachometer
- f. Exhaust analyzer
- g. TAC components
- h. Shop repair manual

TASK

GS-22 Testing and replacing components in the air injection reaction (AIR) system

PERFORMANCE OBJECTIVE

Test and replace components in the air injection reaction (AIR) system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. AIR system function
- b. AIR components
- c. AIR components function

Provide Demonstration On:

- a. Testing AIR system components
- b. Replacing AIR system components

Provide Practical Application On:

Testing and replacing AIR system components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

- a. Prentice-Hall, "Servicing Ford and General Motors Emission Control Systems," filmstrip
- b. Bergwall, "Automotive Pollution Control," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-16
- b. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools
- b. Tachometer
- c. Vacuum gauge

(Continued on back)

LAB HOURS 2

CLASS HOURS 2

III-377

EVALUATION

(GS-22)

- a. Given an operational gas engine with AIR emissions system and necessary tools and equipment, the learner will test and replace the system components according to standards in the auto shop repair manual or manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. Soap and water container
- e. Exhaust analyzer
- f. Air system components
- g. Shop repair manual

TASK

GS-23 Testing and replacing components in the spark control system

PERFORMANCE OBJECTIVE

Test and replace components in the spark control system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Spark control system function
- b. Spark control components
- c. Spark control components function

Provide Demonstration On:

- a. Testing spark control components
- b. Replacing spark control components

Provide Practical Application On:

Testing and replacing spark control components

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Crouse and Anglin, Automotive Emission Control
- b. Johnson, Automotive Diagnosis and Tune-Up
- c. Wetzel, Automotive Diagnosis and Tune-Up

A/Vs:

Prentice-Hall, "Servicing Ford and General Motors Emission Control Systems," filmstrip

Student Manuals:

- a. Georgia, Auto Mechanics, Unit 262-19
- b. MAVCC, Automotive Emission Control

Tools and Equipment:

- a. Hand tools
- b. Emissions analyzer
- c. Tachometer

(Continued on back)

LAB HOURS 2

CLASS HOURS 2

EVALUATION

(GS-23)

- a. Given an operational engine with spark control emissions system and necessary tools and equipment, the learner will test and replace system components according to standards in the auto shop repair manual or manufacturer's specifications.
- b. Georgia Student Assessment System, Domain Referenced Tests, Transportation/Automotive Mechanics, Vols. I and II.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. Vacuum gauge
- e. Hoist
- f. Spark control components
- g. Shop repair manual

TASK

DE-01 Testing to determine engine condition

PERFORMANCE OBJECTIVE

Perform necessary tests to determine engine condition and needed repair procedures.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Significance of sounds
- b. Exhaust smoke color
- c. Exhaust smoke odor
- d. Dynamometer test results
- e. Fuel pump test results
- f. Governor testing
- g. Compression test results
- h. Cylinder leakage test results
- i. Engine operating logs

Provide Demonstration On:

- a. Making observations
 1. Sounds
 2. Sight
 3. Odor
- b. Dynamometer testing
- c. Fuel pump testing
- d. Governor tests
- e. Compression tests
- f. Leakage test

Provide Practical Application On:

Performing observations and tests, recording data and interpreting these test results on an operational engine

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Kates, Diesel and High Compression Gas Engines
- c. Toboldt, Diesel Fundamentals, Service, Repair

A/Vs:

Bergwall, "The Four Cycle Diesel Engine," filmstrip; "The Two Cycle Turbocharged Diesel Engine," filmstrip; "Problems of the Internal Combustion Explained," filmstrip; "The Internal Combustion Engine," filmstrip

Student Manuals:

MAVCC, Diesel Engine Mechanics, Units GI, G-II, G-III

Tools and Equipment:

- a. Engine for testing
- b. Hand tools
- c. Compression tester
- d. Cylinder leakage tester
- e. Dynamometer

(Continued on back)

LAB HOURS 15

CLASS HOURS 10

III-381

EVALUATION

(DE-01)

- a. Given an operational engine and necessary tools, gages and diagnostic equipment, the learner will perform the necessary tests to evaluate the condition of the engine, record and interpret data. Compression pressures must be within 5 PSIG of known values. Leakage rates must be to within 5% of values obtained by the instructor.
- b. V'TECS, Diesel Mechanic, Tasks A-07, A-08, A-09, A-10, A-11, A-12, A-13, E-01 - E-11.

INSTRUCTIONAL ACTIVITIES

Tools and Equipment:

- e. Dynamometer
- f. Fuel pump test kit
- g. Precisely calibrated test tachometer
- h. Engineers stethoscope
- i. Engine manual

TASK

DE-02 Performing major and minor tune-up

PERFORMANCE OBJECTIVE

Perform major and minor tune-up and fuel system service on diesel engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Re-torque cylinder head
- b. Adjusting tappet clearance
- c. Cleaning and adjusting injectors and/or injection nozzles
- d. Static check of fuel pump timing
- e. Replacing primary and secondary fuel filters - draining and cleaning all water traps
- f. Servicing air cleaner
- g. Checking and overhauling/ replacing injection pump if needed
- h. Bleeding fuel system

(Continued on back)

Provide Demonstration On:

Complete step by step major tune-up explaining differences with minor tune-up

Provide Practical Application On:

Performing both the minor and major tune-up

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Kates and Luck, Diesel and High Compression Gas Engines
- c. Toboldt, Diesel Fundamentals, Service, Repair

Student Manuals:

MAVCC, Diesel Engine Mechanics, Units G-I, G-II, G-III

Tools and Equipment:

- a. Hand tools
- b. Feeler gages
- c. Filters
- d. Parts washing tank
- e. Injector service kit

(Continued on back)

LAB HOURS 16

CLASS HOURS 4

III-383

EVALUATION

(DE-02)

- a. Given an operational engine and necessary equipment, the learner will perform both minor and major tune-ups, record test readings - both before and after repairs, and return the engine to peak operating efficiency. All clearances will be restored to values within manufacturer's specifications. All torque readings will be within ± 5 ft. lb. and nozzle popping pressures within 25 PSIG.
- b. V'TECS, Diesel Mechanic, Tasks E-01 through E-11, A-09 through A-13.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- i. Checking and adjusting engine idle speed - both high and low idle must be checked if governor is so equipped
- j. Checking and adjusting governor high speed stop
- k. Performing dynamometer test for correct engine horsepower
- l. Checking engine visually for leaks and repairing them
- m. Checking cylinder load balance

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- f. Fuel system bleeding pumps
- g. Accurate test gages
- h. Tachometer in accurate calibration
- i. Engine manual

TASK

DE-03 Reconditioning cylinder head

PERFORMANCE OBJECTIVE

Service and recondition cylinder head.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Removal procedure - remove interference, drain coolant, etc.
- b. Importance of correct loosening procedures for head bolts
- c. Importance of initial inspection
- d. Valve removal and cleaning
- e. "Miking" valve stems
- f. Checking guides for "bell-mouthing"
- g. Cleaning head for further testing
- h. Areas for "heat checking"

(Continued on back)

Provide Demonstration On:

Servicing cylinder heads

Provide Practical Application On:

Reconditioning cylinder head

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair

A/Vs:

Bergwall, "Diesel Mechanics," filmstrip; "How to Overhaul an Engine (Piston Type)," filmstrip

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit C-I

Tools and Equipment:

- a. Complete hand tool set
- b. Straight edge
- c. Feeler gages
- d. Valve grinder
- e. Valve seat grinder

(Continued on back)

LAB HOURS 15

CLASS HOURS 5

III-385

EVALUATION

(DE-03)

- a. Given an engine requiring cylinder head service and necessary tools and equipment, the learner will restore the cylinder head to "like new" condition. All precision measurements will be taken and recorded with an accuracy of $\pm .002$ ", valve seats will be ground to correct angles within $1/2$ degrees, width will be within $1/32$ ", valve faces will be ground with no discernible variation from required angle (from manual) and the margins will be $1/32$ " or greater.
- b. V'TECS, Diesel Mechanic, Tasks B-01 through B-12.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- i. Spot-check on magna-flux testing
- j. Checking for warpage, distortion
- k. Refacing valves and ends of stems
- l. Reforming seats/replacement where needed
- m. Valve spring inspection and tension tests
- n. Servicing rocker arms, push rods and cam follower assemblies
- o. Reassembly and re-installation

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- f. Prussian blue or Dyken
- g. Spot-check/Eyglow or magna-flux
- h. Parts-springs, valves, seats, keepers, guides
- i. Valve guide knurling kit
- j. Micrometers - 0 to 1"
- k. Dial indicator with attachments
- l. "Run out" test fixtures

TASK

DE-04 Performing an in-frame overhaul

PERFORMANCE OBJECTIVE

Perform engine overhaul without removing engine from the vehicle.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Removal of interference, pan, hood, radiator, filters and generators
- b. Removal of rocker arm cover and rocker arm assemblies and push rods
- c. Removal of intake and exhaust manifolds
- d. Removal of water manifold thermostat housing
- e. Removal of fuel injection pumps
- f. Removal of cylinder head/heads
- g. Ridge reaming
- h. Liner types

(Continued on back)

Provide Demonstration On:

Overhaul procedures

Provide Practical Application On:

In-frame engine overhaul

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Bergwall, "Diesel Mechanics," filmstrip; "How to Overhaul an Engine (Piston Type)," filmstrip

Student Manuals:

MAVCC, Diesel Engine Mechanics, Units C-I, C-III, C-V, C-VI

Tools and Equipment:

- a. Complete set of hand tools
- b. Plastigage and micrometers inside and outside bore gage
- c. Overhaul gasket set

(Continued on back)

LAB HOURS 25

CLASS HOURS 5

III-387

EVALUATION

(DE-04)

- a. Given an engine requiring in-frame overhaul, necessary tools and parts, the learner will perform a complete in-frame overhaul restoring the engine to like new condition. All measurements will be taken with 100% accuracy, torque valves will be to + 5% of required valves, timing marks will match exactly and clearances will be within the tolerances given in the manufacturer's manual.
- b. V'TECS, Diesel Mechanic, Tasks C-1 through C-12, D-1 through D-20.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- i. Checking for numbers on pistons/rods before removal, numbering them if they are not already numbered and insuring rod and cap bear matching numbers
- j. Piston and connecting rod removal
- k. Cam follower removal
- l. Camshaft and timing gear removal
- m. Inspection procedures
- n. Reassembly to insure rings are correctly butt gapped
- o. Liner replacement if required
- p. Precision measurement of engine parts

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. Rings, bearings, gears, etc.
- e. Engine manual
- f. Ridge reamer
- g. Equipment for cylinder head service

TASK

DE-05 Performing "bench" overhaul

PERFORMANCE OBJECTIVE

Perform a complete overhaul of a diesel engine out of the frame.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Engine removal procedure
- b. Preliminary cleaning
- c. Removal of interference - hood, side panels or tilt cab
- d. Disconnecting all fuel, air, water lines and electrical wiring
- e. Removing manifolds and air/exhaust piping
- f. Removing generator, starter motor and other interference components
- g. Installing lifting brackets, sling or chain
- h. Positioning hoist or adequate capacity
- i. Safe operating procedures

Provide Demonstration On:

Bench overhaul procedures

Provide Practical Application On:

Complete bench reconditioning of engine

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Bergwall, "Diesel Mechanics," filmstrip; "How to Overhaul an Engine (Piston Type)," filmstrip

Student Manuals:

MAVCC, Diesel Engine Mechanics, Units C-II, C-III, C-IV, C-V

Tools and Equipment:

- a. Complete set of hand tools
- b. Plastigage, boregauge, inside and outside micrometers, dial indicator
- c. Overhaul gasket set

(Continued on back)

LAB HOURS 30

CLASS HOURS 10

EVALUATION

(DE-05)

- a. Given an engine with usable block, head and crankshaft, necessary tools, parts and equipment, the learner will completely overhaul the engine restoring it to like new condition. All dimensions will be as near like new as possible, all clearances will be exactly the same as in a new engine, all torque valves will be within + 5% of those given in the manual and timing will be precisely accurate. Power output will equal or exceed that from a new engine. No variation from engine manual tolerances will be acceptable.
- b. V'TECS, Diesel Mechanic, Tasks B-01 through B-12, C-01 through C-12, D-01 through D-20, E-01 through E-11, F-01 through F-13, G-01 through G-5.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- d. Rings, bearings, gears, etc.
- e. Ridge reamer
- f. Lifting sling and brackets
- g. Engine hoist
- h. Engine rebuild stand
- i. Run out test fixtures
- j. Equipment for cylinder head service
- k. Engine manual

TASK

DE-06 Demonstrating governor principles of operation

PERFORMANCE OBJECTIVE

Establish an understanding of why a governor is needed on a diesel engine and how it works to control or limit the engine speed.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Why governor is essential for diesel engines
- b. Basic governor parts - ball head and speeder spring
- c. How governor works - centrifugal force balanced by spring tension
- d. How governor is driven
- e. How flyweight motion is transmitted to throttle controls

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Cummins, "Principles of Mechanical Governors," slide/tape

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit E-VII

Tools and Equipment:

Governor cutaways

LAB HOURS

6

CLASS HOURS

4

III-391

EVALUATION

(DE-06)

- a. Given a governor mock-up or cutaway, the learner will trace the train of events that result from a speed change with 90% accuracy and that result from speeder spring tension change with 90% accuracy. Part names must be mastered with 100% accuracy.
- b. V'TECS, Diesel Mechanic, Task E-11.

TASK

DE-07 Using correct terminology (governors)

PERFORMANCE OBJECTIVE

Establish a vocabulary of terms related to governors and the correct meanings for them.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Sensitivity
- b. Stability
- c. Surging
- d. Hunting
- e. Speed droop
- f. Percent of regulation
- g. Under run
- h. Over run
- i. Speed limiting
- j. Speed regulating
 - 1. Variable speed
 - 2. Constant speed
- k. Isochronous
- l. Adjustment procedures

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Cummins, "Principles of Mechanical Governors," slide/tape

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit E-VII

Tools and Equipment:

- a. Governor equipped engine with means of controlling load - dynamometer
- b. Accurate tachometer

LAB HOURS 2

CLASS HOURS 2

EVALUATION

(DE-07)

- a. Given a governor mock-up or cutaway or an engine mounted governor, the learner will identify the type of governor with 75% accuracy and match each part with its function.
- b. Textbooks have questions included.
- c. V'TECS, Diesel Mechanic, Task E-11.

TASK

DE-08 Classifying governors

PERFORMANCE OBJECTIVE

Establish a knowledge of how governors are classified.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Classification by method of operation - mechanical or hydraulic
- b. Classification by function overspeed trip, speed regulating variable speed
- c. Load control
- d. Pressure regulating
- e. Electric load sensitive
- f. Pneumatic
- g. Vacuum

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Cummins, "Fuel Pump Governors," slides

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit E-VII

Tools and Equipment:

- a. Hand tools
- b. Allen wrenches
- c. Tachometer

LAB HOURS 4

CLASS HOURS 2

III-395

EVALUATION

(DE-08)

Given instruction, the learner will match descriptions of governor operation and characteristics of appropriate governor classification. Eighty percent accuracy is required.

TASK

DE-09 Adjusting hydraulic governors

PERFORMANCE OBJECTIVE

Establish a firm understanding of a hydraulic governor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Basic parts
- b. Spatial relationships of parts
- c. Individual parts functions
- d. Combined functions
- e. Adjustments
- f. Need for extreme care and cautious adjustment

Provide Demonstration On:

- a. Disassembly
- b. Adjustments

Provide Practical Application On:

Disassembly, inspection, re-assembly and adjustment of hydraulic governors

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit E-VII

Tools and Equipment:

- a. Hand tools
- b. Allen wrenches
- c. Bench vise
- d. Snap ring pliers - inside and outside

LAB HOURS 6

CLASS HOURS 2

III-397

EVALUATION

(DE-09)

- a. Given a hydraulic governor, tools and equipment necessary for service, the learner will disassemble, inspect and reassemble the governor and list all parts which are worn and need replacement or repair.
- b. V'TECS, Diesel Mechanic, Task E-11.

TASK

DE-10 Troubleshooting governors

PERFORMANCE OBJECTIVE

Troubleshoot governors.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Symptom identification
- b. Symptom evaluation
- c. Problem diagnosis
- d. Problem correction procedure
- e. Need for extreme care in all governor work

Provide Demonstration On:

Troubleshooting technique and corrective procedure

Provide Practical Application On:

Troubleshooting a governor

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Toboldt, Diesel Fundamentals, Service, Repair
- b. Kates and Luck, Diesel and High Compression Gas Engines

Student Manuals:

MAVCC, Diesel Engine Mechanics, Section G

Tools and Equipment:

- a. Engine with governor problem
- b. Hand tools
- c. Accurate tachometer

LAB HOURS 6

CLASS HOURS 2

EVALUATION

(DE-10)

- a. Given an engine with a faulty governor and necessary tools and equipment, the learner will list symptoms, evaluate the symptoms to determine the problem and correct the problem in twice the time required by the instructor. Problem diagnosis must be with 100% accuracy, the repair must be 100% reliable and the engine speed controlled within 2% of new governor levels.
- b. V'TECS, Diesel Mechanic, Tasks E-01, E-02, E-09, E-11.

TASK

DE-11 Identifying diesel fuel system components

PERFORMANCE OBJECTIVE

Identifying and defining fuel system components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Storage tank requirements
- b. Transfer methods/hazards
- c. In-tank strainers
- d. Vehicle or day tank storage
- e. In-line strainers and filters
- f. Importance of clean, dry fuel
- g. Coalescer operation
- h. Dessicant dryers
- i. Centrifuges as separators
- j. Primary, secondary and tertiary filters
- k. Fuel injection pump types
- l. Unit injector - typified by GM

Provide Practical Application On:

Identifying parts on a schematic drawn

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit E-I

LAB HOURS 3

CLASS HOURS 3

III-401

EVALUATION

(DE-11)

- a. Given a fuel system part or picture of it, the learner will write the correct name of part with 100% accuracy. The learner will demonstrate an ability to draw a schematic of a fuel system and note readings at various points to insure proper operation.
- b. Textbooks have questions included.
- c. V'TECS, Diesel Mechanic, Tasks A-11, E-01 through E-11.

TASK

DE-12 Disassembling, inspecting and reassembling the jerk pump

PERFORMANCE OBJECTIVE

Rebuild the jerk pump.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Definition of jerk pump
- b. Component parts and names
- c. How it pumps fuel
- d. How it meters (measures) fuel
- e. How it is controlled
- f. Meaning of APF/APE

Provide Demonstration On:

Disassembling, inspecting and assembling the jerk pump

Provide Practical Application On:

Disassembling, inspecting and reassembling a Bosch APF pump

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

Student Manuals:

MAVCC, Diesel Engine Mechanic, Units E-1, E-11

Tools and Equipment:

- a. Hand tools
- b. APF pump
- c. Bench vise

LAB HOURS 6

CLASS HOURS 3

III-403

EVALUATION

(DE-12)

- a. Given a APF pump and tools and equipment, the learner will disassemble the pump, identify all parts, inspect parts for damage and reassemble the pump. Part names must be given with 100% accuracy. All parts must be reassembled in proper positions with 100% accuracy. Damaged parts will be identified and the nature of damage identified with 90% accuracy.
- b. V'TECS, Diesel Mechanic, Tasks E-09, E-10.

TASK

DE-13 Testing and calibrating a multiple plunger injection pump

PERFORMANCE OBJECTIVE

Test and calibrate a multiple plunger injection pump.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Design of APE pumps
- b. Comparison with APF
- c. Part names
- d. Metering
- e. Raising pressure
- f. Engine/pump timing
- g. Types of governor and how driven
- h. Calibration procedures
- i. Troubleshooting procedures

Provide Demonstration On:

Testing and calibrating multiple plunger injection pumps

Provide Practical Application On:

Testing and calibrating multiple plunger injection pump

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Engines

Student Manuals:

MAVCC, Diesel Engine Mechanic, Units E-I, E-III

Tools and Equipment:

- a. Hand tools
- b. Pump calibration stand
- c. Calibrated test nozzles
- d. Pump

(Continued on back)

LAB HOURS 20

CLASS HOURS 4

III-405

EVALUATE

(DE-13)

- a. Given a disassembled in-line fuel injection pump, tools and equipment, the learner will write the names of the pump parts with 100% accuracy, describe their functions with 80% accuracy, reassemble the pump correctly and calibrate to less than 20 cc per 1000 strokes on a typical pump.
- b. V'TECS, Diesel Mechanic, Tasks E-09, E-10.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- e. Pump specification sheet
- f. Test stand manual
- g. Proper engine manual

TASK

DE-14 Testing and calibrating the distributor type fuel injection pumps

PERFORMANCE OBJECTIVE

Test and calibrate the distributor type fuel injection pump.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Definition of terms
- b. Sleeve metering in Bosch PSJ, PSB
- c. Valve and port metering CAV and ROOSA
- d. Engine/pump timing
- e. Governors used
- f. Calibration procedures
- g. Troubleshooting procedures

Provide Demonstration On:

Disassembling, inspecting, reassembling and calibrating the distributor type fuel injection pump

Provide Practical Application On:

Removing, disassembling, repairing and replacing distributor type fuel injection pump

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit E-II

Tools and Equipment:

- a. Hand tools
- b. Pump test stand
- c. Test nozzles
- d. Distributor type fuel pump
- e. Pump specification sheet
- f. Test stand manual
- g. Engine manual

LAB HOURS 8

CLASS HOURS 4

III-407



(DE-14)

- a. Given a distributor type fuel injection pump, tools and necessary equipment, the learner will name pump parts with 100% accuracy, describe functions with 80% accuracy and troubleshoot and repair the pump to manufacturer's specifications $\pm 2\%$.
- b. Textbooks have questions included.

TASK

DE-15 Reconditioning and calibrating fuel injectors

PERFORMANCE OBJECTIVE

Recondition and adjust fuel injector.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Comparing unit injector parts with jerk pump parts
- b. Similiarity of shapes
- c. Comparing parts of unit injector tip with injection nozzle parts
- d. Disassembling, inspecting and repairing unit injector procedures
- e. Disassembling, inspecting and repairing injector nozzle procedures
- f. Adjustments on injection nozzle

(Continued on back)

Provide Demonstration On:

Reconditioning of unit injector, Bosch injector nozzle, popping pressure adjustment and paper penetration nozzle spray pattern

Provide Practical Application On:

Reconditioning of unit injector, Bosch injector nozzle and popping pressure adjustment

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Prentice-Hall, "The GM Detroit Diesel Engine Fuel Injector," filmstrip; "Servicing the GM Detroit Diesel Fuel Injector," filmstrip

Student Manuals:

MAVCC, Diesel Engine Mechanics, Units E-IV, E-VI

Tools and Equipment:

- a. Unit injector
- b. Bosch injection nozzle
- c. Hand tools
- d. Lapping block

(Continued on back)

LAB HOURS 20

CLASS HOURS 6

EVALUATION

(DE-15)

- a. Given a unit injector or injection nozzle, necessary tools and equipment, the learner will test the injector/nozzle to determine needed repairs and restore to like new condition with 100% accuracy.
- b. V'TECS, Diesel Mechanic, Tasks E-4, E-5, E-6.

INSTRUCTIONAL MATERIALS

Tools and Equipment:

- e. Two grades - or more lapping compound
- f. Injection nozzle reconditioning tool kit
- g. Injection nozzle pop tester with adapters
- h. Unit injector flow comparator
- i. Needed repair parts
- j. Comparator fluid (diesel fuel will be adequate for less than 30 day storage)
- k. Specification sheets for injectors in use
- l. Bronze bristle wire brush
- m. Mutton tallow
- n. Ultrasonic cleaner and fluid
- o. Bench vise
- p. GM injector holding fixture
- q. Parts trays
- r. Special wrenches for injectors in use
- s. Safety glasses or face shield
- t. Apron
- u. Wiping rags or paper towels (must be lint free and soft)

TASK

DE-16 Troubleshooting the Cummins PT fuel system

PERFORMANCE OBJECTIVE

Establish a troubleshooting plan and repair the Cummins PT fuel system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Pumps proceeding in Cummins engines
- b. Basic theory and identification
- c. Construction features of pump and injector nozzle
- d. Operation of pump/nozzle
- e. Pump repair and calibration
- f. Pump troubleshooting
- g. Injector repair and calibration
- h. Injector troubleshooting
- i. Installation and adjustment of injector

Provide Demonstration On:

Troubleshooting and repairing Cummins PT pump and injector

Provide Practical Application On:

Troubleshooting and repairing Cummins PT pump and injector

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

Cummins, "Checking Ignition Timing," movie film; "Troubleshooting Performance Makes a Winner," movie film; "Theory of PT Fuel System," slide set;

(Continued on back)

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit E-V

Tools and Equipment:

- a. Hand tools
- b. Pump and nozzles
- c. Leakage tester
- d. Pump test stand with flow comparator

(Continued on back)

LAB HOURS 28

CLASS HOURS 10

III-411

EVALUATION

(DE-16)

- a. Given a Cummins engine with a faulty PT(G) fuel pump and PT(B) or PT(C) injector nozzles, the necessary tools and equipment, the learner will determine necessary repairs and restore the fuel system to performance specifications given in the appropriate manuals.
- b. V'TECS, Diesel Mechanic, Tasks E-01 through E-11.

INSTRUCTIONAL MATERIALS

A/Vs:

"The Cummins PT fuel Injector," slide/set; "Operation Adjustment of PT (Type G) Fuel Pump," slide set; "PT (Type B) and PT (Type C) Fuel Injectors," slide set; "Calibration of PT Fuel Injectors," slide set; "Troubleshooting PT Fuel Systems," slide set

Tools and Equipment:

- e. Ignition nozzle reconditioning kit
- f. Mutton tallow
- g. Replacement parts (cups, orifices, etc.)
- h. Pump manual
- i. Injector manual
- j. Engine manual
- k. Test stand manual
- l. Special wrenches
- m. Test stand calibration fluid
- n. Apron
- o. Wipe rags or paper towels (soft and lint free)

TASK

DE-17 Repairing blowers, turbochargers and superchargers.

PERFORMANCE OBJECTIVE

Establish a troubleshooting plan and repair blowers, turbochargers and superchargers.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Roots blower
- b. Hamilton-Whitworth
- c. Scavenging - port and valve, loop, uniflow, direct
- d. Turbochargers - Cummins and Schwitzer
- e. Superchargers
- f. Aftercoolers
- g. Troubleshooting and repair
- h. Emphasizing seal and balance problems

Provide Demonstration On:

Operating, troubleshooting and repairing blowers and turbochargers

Provide Practical Application On:

Operating, troubleshooting and repairing blowers and turbochargers

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Dagel, Diesel Engine Repair
- b. Toboldt, Diesel Fundamentals, Service, Repair
- c. Kates and Luck, Diesel and High Compression Gas Engines

A/Vs:

- a. Prentice-Hall, "Servicing the GM Detroit Diesel Engine," filmstrip

(Continued on back)

Student Manuals:

MAVCC, Diesel Engine Mechanics, Unit D-III

Tools and Equipment:

- a. Hand tools
- b. Micrometers
- c. Dial indicators
- d. Feeler gages
- e. Engine manual

(Continued on back)

LAB HOURS 20

CLASS HOURS 6

EVALUATION

(DE-17)

- a. Given an engine equipped with a faulty blower, turbocharger or supercharger, the learner will list symptoms, evaluate them to determine the problem and take corrective action required to restore the air system to optimum operating condition with 100% accuracy.
- b. V'TECS, Diesel Mechanic, Task F-01.

INSTRUCTIONAL MATERIALS

A/Vs:

- b. Cummins, "Diesel Race Car," movie film; "Turbocharger," movie film; "Turbocharger Failure Analysis," slide set

Tools and Equipment:

- f. Turbocharger manual
- g. Engineers stethoscope

SECTION IV

CURRICULUM STRUCTURE, EXIT POINTS & COURSE OUTLINE

SECTION IV

Section IV Content List

Introduction to the Curriculum Structure
Curriculum Structure

Group

Individualized

Introduction to Diesel Mechanics Exit Points

Diesel Mechanics Exit Points

Group

Individualized

Introduction to the Course Outline

Course Outline

Section III presented a sample organizational model for sequencing the instruction of program tasks. Based on that model, Section IV provides suggested methods of structuring the entire Diesel Mechanics curriculum.

INTRODUCTION TO THE CURRICULUM STRUCTURE

A curriculum structure is developed by sequencing duties* into a logical teaching plan. Two curriculum structures are presented in this section - group and individualized.

The group designed structure is based on recommendations of Diesel Mechanics instructors in Georgia. The estimated 1872 program hours are distributed over six quarters assuming that each quarter is approximately 312 hours.

The individualized structure also lists the duty areas under major blocks, but does not include hours or quarters. Using the individualized approach, the student proceeds at his or her pace until each task is mastered.

In either type of structure, the duty areas and major blocks can be rearranged to meet local needs.

*Duties are large segments of work done by an individual and usually require several tasks to accomplish. They are generally grouped under the major teaching blocks of the program.

DIESEL MECHANICS SUGGESTED CURRICULUM STRUCTURE*

<u>Course</u>	<u>Class Hours</u>	<u>Lab Hours</u>	<u>Total Hours</u>
<u>Quarter I</u>			
BASIC FUNDAMENTALS:			
Related Instruction	40	70	110
HEAVY DUTY SERVICE AND REPAIR:			
Perform service checks	11	33	44
Service, maintain and repair the starting system	7	33	40
Service, maintain and repair the charging system	17	40	57
Service, maintain and repair the heating and cooling systems	17	44	61
	<u>92</u>	<u>220</u>	<u>312</u>

<u>Quarter II</u>			
HEAVY DUTY SERVICE AND REPAIR:			
Service, maintain and repair the heating and cooling systems	5	14	19
Service, maintain and repair the braking system	18	72	90
Service, maintain and repair the suspension system	25	90	115
Service, maintain and repair the steering system	16	49	65
Service and repair the exhaust system	7	16	23
	<u>71</u>	<u>241</u>	<u>312</u>

<u>Quarter III</u>			
ACCESSORIES:			
Test and maintain electrical circuits	36	96	132
Test and maintain the air conditioning system	24	60	84
POWER TRAINS:			
Service, maintain and repair the manual transmission	22	74	96
	<u>82</u>	<u>230</u>	<u>312</u>

<u>Quarter IV</u>	<u>Class Hours</u>	<u>Lab Hours</u>	<u>Total Hours</u>
POWER TRAINS:			
Service, maintain and repair the drive line and differential	42	150	192
Service, maintain and repair the automatic transmission	<u>34</u>	<u>86</u>	<u>120</u>
	76	236	312

Quarter V
INTERNAL COMBUSTION ENGINE OVERHAUL:

Recondition valves	20	34	54
Replace timing chain and gears (engine in vehicle)	6	14	20
Install a short block assembly	13	27	40
Rebuild engine block assembly	23	71	94

GASOLINE ENGINES:

Service, maintain and repair the fuel system	13	21	34
Service, maintain and repair the ignition system	10	30	40
Service, maintain and repair emission controls	<u>12</u>	<u>18</u>	<u>30</u>
	97	215	312

Quarter VI

DIESEL ENGINES:

Engine overhaul	34	101	135
Diesel engine governors	12	24	36
Fuel injection systems	<u>36</u>	<u>105</u>	<u>141</u>
	82	230	312
Total Program Hours	500	1372	1872

*This curriculum structure is designed to be used for group instruction.

DIESEL MECHANICS SUGGESTED CURRICULUM STRUCTURE*

ORIENTATION:

- School Policies and Procedures
- Program Orientation and Safety
- Operation of Audiovisual Equipment
- Using the Learning Resource Center

BASIC FUNDAMENTALS:

- Related Instruction

HEAVY DUTY SERVICE AND REPAIR:

- Perform Service Checks
- Service, Maintain and Repair the Starting System
- Service, Maintain and Repair the Charging System
- Service, Maintain and Repair the Heating and Cooling Systems
- Service, Maintain and Repair the Braking System
- Service, Maintain and Repair the Suspension System
- Service, Maintain and Repair the Steering System
- Service and Repair the Exhaust System

ACCESSORIES:

- Test and Maintain Electrical Circuits
- Test and Maintain the Air Conditioning System

POWER TRAINS:

- Service, Maintain and Repair the Manual Transmission
- Service, Maintain and Repair the Drive Line Differential
- Service, Maintain and Repair the Automatic Transmission

INTERNAL COMBUSTION ENGINE OVERHAUL:

- Recondition Valves
- Replace Timing Chain and Gears (Engine in Vehicle)
- Install a Short Block Assembly
- Rebuild Engine Block Assembly

GASOLINE ENGINES:

- Service, Maintain and Repair the Fuel System
- Service, Maintain and Repair the Ignition System
- Service, Maintain and Repair Emission Controls

DIESEL ENGINES:

- Engine Overhaul
- Diesel Engine Governors
- Fuel Injection Systems

*This curriculum structure is designed to be used for individualized instruction.

INTRODUCTION TO DIESEL MECHANICS EXIT POINTS

The following diagrams illustrate points in the Diesel Mechanics program where a student should have acquired competencies necessary for entry level employment.

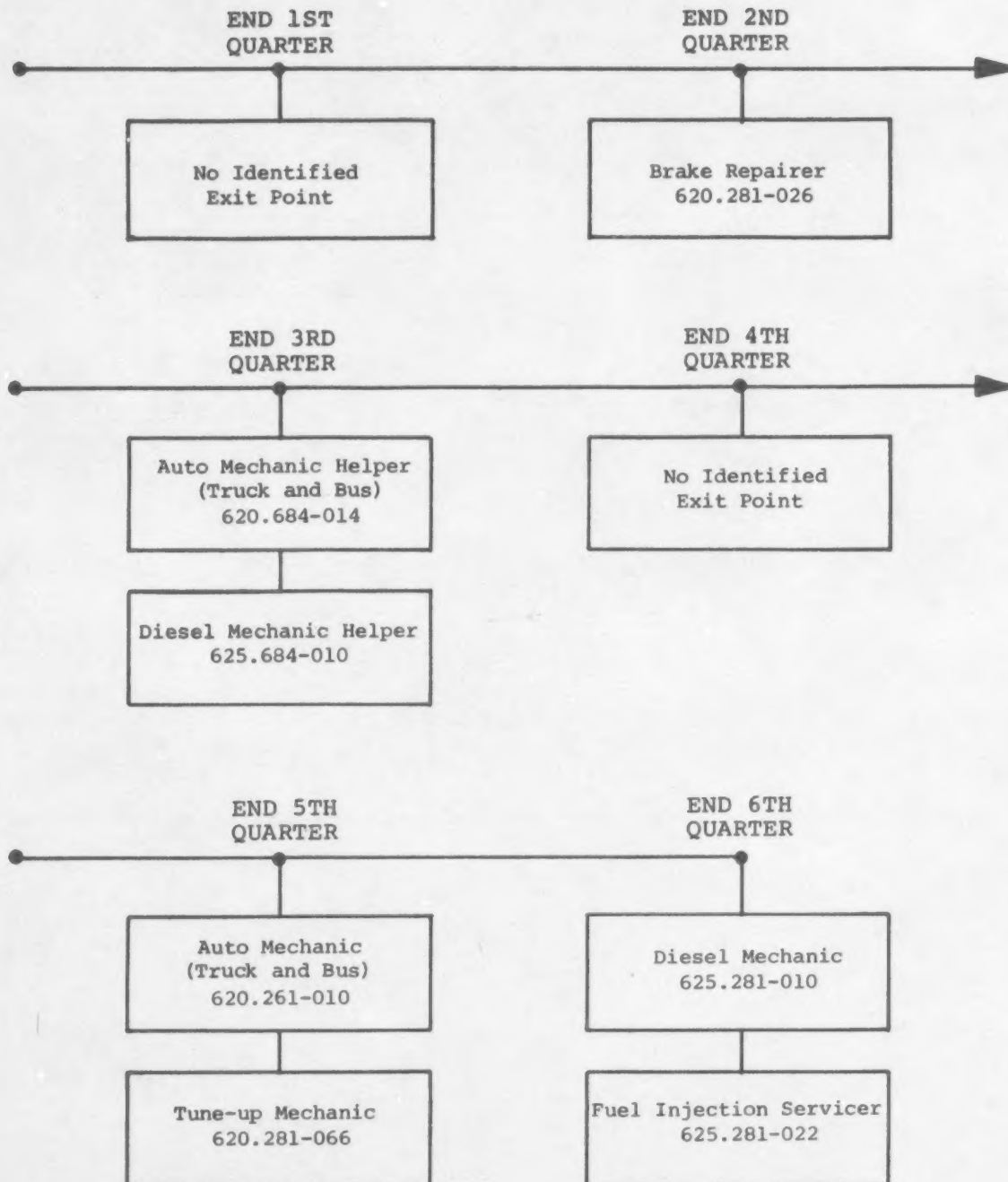
Both the group and individualized exit point diagrams sequence the Diesel Mechanics job classifications from least to most difficult. The group exit point diagram illustrates a lock-step process in which students proceed through an entire program at the same pace and exit at approximately the same point in time.

The individualized exit point diagram illustrates a self-paced progression through the Diesel Mechanics program. This approach permits a student to complete any one or all tasks necessary for entry level employment.

The major difference between the group and individualized approach is the number of tasks a student must master. For example, in the individualized approach, a student desiring employment as a Tune-Up Mechanic needs to complete only those tasks identified for that job. However, in the group approach, a student must master the tasks in the previous DOT classifications leading to that particular job title.

Both diagrams are based on the preceeding suggested curriculum structures.

DIESEL MECHANICS
(Group Instruction)



DIESEL MECHANICS
(Individualized Instruction)

Brake Repairer
620.281-026

Auto Mechanic Helper
(Truck and Bus)
620.684-014

Diesel Mechanic Helper
625.684-010

Auto Mechanic
(Truck and Bus)
620.261-010

Tune-up Mechanic
620.281-066

Diesel Mechanic
625.281-010

Fuel Injection Servicer
625.281-022

INTRODUCTION TO THE COURSE OUTLINE

A course outline suggests a method of sequencing tasks for instruction. In the following outline, the unit guide tasks are ordered according to duty areas. The tasks are then arranged from general to specific knowledge and applications. The instructor is not restricted to using this specific outline, but may adapt it to meet his or her teaching needs.

Class and lab hours for each task are assigned according to Diesel Mechanics instructors and incumbent workers recommendations. The estimated time allotments for all major blocks total 1872 hours. Of this, the student spends approximately 73% in the lab.

The following course outline is designed for group instruction, however, it may be adapted for individualized instruction by eliminating the time sequencing for tasks.

DIESEL MECHANICS SUGGESTED COURSE OUTLINE

<u>Quarter I</u>			
<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
MAJOR BLOCK: BASIC FUNDAMENTALS			
DUTY A: <u>RELATED INSTRUCTION</u>			
RI-01	Demonstrating and utilizing school and shop policies and procedures	2	4
RI-02	Maintaining a parts inventory	2	4
RI-03	Reading and interpreting the shop service manuals	2	4
RI-04	Completing job work order forms	2	2
RI-05	Identifying and maintaining shop tools and equipment	2	6
RI-06	Using precision measurement tools and equipment	3	5
RI-07	Demonstrating engine theories of operation	6	4
RI-08	Demonstrating a knowledge of electricity fundamentals	2	4
RI-09	Demonstrating a knowledge of fuels	2	4
RI-10	Demonstrating a knowledge of lubricants	2	4
RI-11	Demonstrating a knowledge of hardware and fasteners	2	4
RI-12	Demonstrating basic metal operations	2	8
RI-13	Demonstrating welding and soldering techniques	2	4
RI-14	Demonstrating a knowledge of mathematics	3	3
RI-15	Demonstrating a knowledge of applied science	2	4
RI-16	Non-destructive testing of engine parts	4	6
		<u>40</u>	<u>70</u>
MAJOR BLOCK: HEAVY DUTY SERVICE AND REPAIR			
DUTY A: <u>PERFORM SERVICE CHECKS</u>			
HD-01	Checking and changing engine oil and oil filter	1	3
HD-02	Checking fluid level and refilling transmission and rear end	1	2
HD-03	Lubricating chassis and components	1	2
HD-04	Checking and replacing windshield wiper blades	1	2
HD-05	Repairing tires and tubes	2	6
HD-06	Replacing light bulbs and fuses	2	4
HD-07	Washing and waxing vehicle	1	6
HD-08	Performing state inspection	2	8
		<u>11</u>	<u>33</u>

<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
DUTY B: <u>SERVICE, MAINTAIN AND REPAIR THE STARTING SYSTEM</u>			
HD-09	Servicing battery and cables	1	3
HD-10	Replacing and rebuilding solenoids and switches	1	6
HD-11	Removing and replacing the starter	1	4
HD-12	Disassembling and inspecting the starter components	1	4
HD-13	Reconditioning the starter components	1	4
HD-14	Reassembling and testing the starter	0	6
HD-15	Diagnosing starter system problems	2	6
		<u>7</u>	<u>33</u>
DUTY C: <u>SERVICE, MAINTAIN AND REPAIR THE CHARGING SYSTEM</u>			
HD-16	Testing the DC generator and regulator	3	6
HD-17	Testing the alternator and regulator	2	6
HD-18	Removing, disassembling and inspecting the generator	2	4
HD-19	Rebuilding the generator	2	4
HD-20	Removing, disassembling and inspecting the alternator	2	4
HD-21	Rebuilding the alternator	2	6
HD-22	Removing and replacing generators and alternators	2	6
HD-23	Diagnosing charging system problems	2	4
		<u>17</u>	<u>40</u>
DUTY D: <u>SERVICE, MAINTAIN AND REPAIR THE HEATING AND COOLING SYSTEM</u>			
HD-24	Checking coolant level and freezing point	2	2
HD-25	Cleaning and flushing the system	1	2
HD-26	Inspecting, adjusting or replacing fan belts and hoses	2	6
HD-27	Testing system with pressure	1	2
HD-28	Removing, repairing and replacing the radiator or heat exchanger	4	8
HD-29	Testing and replacing thermostats and radiator caps	2	6
HD-30	Replacing the variable speed fan	2	6
HD-31	Replacing the water pump	2	8
HD-32	Repairing the heater controls	1	4
		<u>17</u>	<u>44</u>
Total Quarter I Class and Lab Hours		92	220
Total Quarter I Instructional Hours			312

Quarter II

<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
MAJOR BLOCK: HEAVY DUTY SERVICE AND REPAIR			
DUTY D: <u>SERVICE, MAINTAIN AND REPAIR THE HEATING AND COOLING SYS- TEM</u>			
HD-33	Removing, repairing and replacing the heater core	2	8
HD-34	Diagnosing cooling system problems	3	6
		<u>5</u>	<u>14</u>
DUTY E: <u>SERVICE, MAINTAIN AND REPAIR THE BRAKING SYSTEM</u>			
HD-35	Identifying brake system components	4	8
HD-36	Adjusting brakes	1	4
HD-37	Removing and rebuilding brake cylinders/ air chambers	2	10
HD-38	Removing and rebuilding brake calipers	2	8
HD-39	Replacing brake shoes and pads	1	8
HD-40	Machining brake drums	1	6
HD-41	Machining brake rotors	1	6
HD-42	Replacing hydraulic control or air valves and lines	2	10
HD-43	Replacing power brake units	2	6
HD-44	Diagnosing brake system problems	2	6
		<u>18</u>	<u>72</u>
DUTY F: <u>SERVICE, MAINTAIN AND REPAIR THE SUSPENSION SYSTEM</u>			
HD-45	Identifying suspension system components	2	6
HD-46	Inspecting suspension system components	2	6
HD-47	Lubricating and adjusting front wheel bearings	1	4
HD-48	Replacing shock absorbers	2	6
HD-49	Replacing front coil springs and rear leaf springs	2	12
HD-50	Changing and balancing wheels and tires	2	8
HD-51	Replacing upper and lower control arms and bushings	2	8
HD-52	Replacing upper and lower ball joints	2	8
HD-53	Replacing king pins and bushings	2	10
HD-54	Replacing torsion bars	2	8
HD-55	Replacing twin I-beams	2	10
HD-56	Diagnosing suspension system problems	4	4
		<u>25</u>	<u>90</u>

<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
DUTY G: <u>SERVICE, MAINTAIN AND REPAIR THE STEERING SYSTEM</u>			
HD-57	Identifying steering system components	2	6
HD-58	Adjusting manual steering gear	1	3
HD-59	Inspecting and replacing steering gear linkage	2	8
HD-60	Replacing power steering unit	4	10
HD-61	Replacing steering column	1	8
HD-62	Aligning the front-end	3	10
HD-63	Diagnosing steering system problems	3	4
		<u>16</u>	<u>49</u>
DUTY H: <u>SERVICE AND REPAIR THE EXHAUST SYSTEM</u>			
HD-64	Identifying emissions control components	2	2
HD-65	Removing and replacing exhaust pipes, mufflers and tail pipes	2	10
HD-66	Diagnosing emissions control and exhaust system problems	3	4
		<u>7</u>	<u>16</u>
Total Quarter II Class and Lab Hours		71	241
Total Quarter II Instructional Hours			312

Quarter III

<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
MAJOR BLOCK: ACCESSORIES			
DUTY A: <u>TEST AND MAINTAIN ELECTRICAL CIRCUITS</u>			
AC-01	Replacing wiring and making splices	2	4
AC-02	Testing and maintaining electrical protection devices	6	4
AC-03	Testing and repairing the courtesy light circuit	2	6
AC-04	Testing and repairing the parking light and marker lamp circuits	2	6
AC-05	Testing and repairing the back-up light circuit	2	6
AC-06	Testing and repairing the headlight circuit	2	6
AC-07	Testing and repairing the turn signal circuit	2	6
AC-08	Testing and repairing the brake light circuit	2	6
AC-09	Testing and repairing the horn circuit (air or electric)	2	6
AC-10	Testing and repairing the windshield wiper circuit (air or electric)	2	6
AC-11	Testing and repairing the windshield washer circuits	2	6
AC-12	Testing and replacing instrument gauges and sending units	3	10
AC-13	Testing and repairing the C.B. radio power circuit	3	10
AC-14	Testing and trimming the radio antenna	2	4
AC-15	Testing and repairing fog lights	2	10
		<u>36</u>	<u>96</u>
DUTY B: <u>TEST AND MAINTAIN THE AIR CONDITIONING SYSTEM</u>			
AC-16	Testing system performance	4	6
AC-17	Discharging the system	2	6
AC-18	Evacuating and charging the system	2	6
AC-19	Rebuilding compressors	4	6
AC-20	Replacing refrigerant lines and accessories	2	8
AC-21	Installing air conditioning units	6	24
AC-22	Diagnosing air conditioning problems	4	4
		<u>24</u>	<u>60</u>

<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
MAJOR BLOCK: POWER TRAINS			
DUTY A: <u>SERVICE, MAINTAIN AND REPAIR</u> <u>THE MANUAL TRANSMISSION</u>			
PT-01	Adjusting and repairing clutch and shift linkage	6	8
PT-02	Removing and disassembling transmission	4	20
PT-03	Inspecting and reassembling transmission	4	20
PT-04	Removing and replacing clutch assembly	2	12
PT-05	Removing and replacing flywheel ring gear	2	6
PT-06	Diagnosing manual transmission problems	4	8
		<u>22</u>	<u>74</u>
Total Quarter III Class and Lab Hours		82	230
Total Quarter III Instructional Hours			312

<u>Quarter IV</u>			
<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
MAJOR BLOCK: POWER TRAINS			
DUTY B: <u>SERVICE, MAINTAIN AND REPAIR THE DRIVE LINE AND DIFFERENTIAL</u>			
PT-07	Inspecting the drive shaft	2	2
PT-08	Removing and replacing universal joints	2	10
PT-09	Removing and replacing constant velocity joints	4	8
PT-10	Removing and replacing rear axle bearings	2	12
PT-11	Removing and disassembling differential assembly	10	15
PT-12	Inspecting and reassembling differential assembly	5	25
PT-13	Removing and replacing front drive axle assembly	5	30
PT-14	Rebuilding the four wheel drive locking hubs	2	12
PT-15	Rebuilding the four wheel drive transfer case	4	30
PT-16	Diagnosing drive line and rear end problems	6	6
		<u>42</u>	<u>150</u>
DUTY C: <u>SERVICE, MAINTAIN AND REPAIR THE AUTOMATIC TRANSMISSION</u>			
PT-17	Testing the automatic transmission	10	10
PT-18	Inspecting and adjusting shift linkage	1	4
PT-19	Removing and replacing the transmission oil filter	2	6
PT-20	Testing and replacing the vacuum modulator	1	4
PT-21	Removing and disassembling transmission	5	20
PT-22	Inspecting and reassembling transmission	5	20
PT-23	Testing transmission on bench	2	10
PT-24	Removing and replacing torque converter	2	6
PT-25	Diagnosing automatic transmission problems	6	6
		<u>34</u>	<u>86</u>
Total Quarter IV Class and Lab Hours		76	236
Total Quarter IV Instructional Hours		312	

<u>Quarter V</u>			
<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
MAJOR BLOCK: INTERNAL COMBUSTION ENGINE OVERHAUL			
DUTY A: <u>RECONDITION VALVES</u>			
IC-01	Determining engine condition	5	8
IC-02	Identifying cylinder head component parts	2	0
IC-03	Adjusting the valves	1	2
IC-04	Removing the cylinder head	1	3
IC-05	Removing and inspecting the valves	1	3
IC-06	Refacing the valves and valve stems	2	4
IC-07	Inspecting the cylinder head	1	1
IC-08	Grinding the valve seats	2	4
IC-09	Servicing the rocker arm, push rod and lifter assemblies	2	2
IC-10	Reassembling and replacing the cylinder head(s)	1	5
IC-11	Diagnosing problems in the valve train	2	2
		<u>20</u>	<u>34</u>
DUTY B: <u>REPLACE TIMING CHAIN AND/OR GEARS (ENGINE IN VEHICLE)</u>			
IC-12	Removing component parts	1	5
IC-13	Removing vibration damper	1	1
IC-14	Removing front cover	1	1
IC-15	Removing and replacing timing chain(s) and/or gears	1	5
IC-16	Replacing front cover and seal	1	1
IC-17	Diagnosing timing chain problems	1	1
		<u>6</u>	<u>14</u>
DUTY C: <u>INSTALL A SHORT BLOCK ASSEMBLY</u>			
IC-18	Removing engine from vehicle	2	4
IC-19	Removing and inspecting useable parts	1	7
IC-20	Assembling new and used parts on block assembly	4	8
IC-21	Installing engine assembly	2	6
IC-22	Testing engine assembly	1	1
IC-23	Diagnosing internal engine failure	3	1
		<u>13</u>	<u>27</u>
DUTY D: <u>REBUILD ENGINE BLOCK ASSEMBLY</u>			
IC-24	Disassembling an internal combustion engine	4	11
IC-25	Cleaning and inspecting block components	5	10
IC-26	Preparing cylinder block	2	8
IC-27	Installing cam bearings	2	4
IC-28	Installing piston pins and rings	2	8
IC-29	Installing crankshaft	2	6

<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
IC-30	Installing liners, pistons and rod bearings	2	8
IC-31	Installing oil pump, oil pan and component parts	4	16
		<u>23</u>	<u>71</u>

MAJOR BLOCK: GASOLINE ENGINES

DUTY A: SERVICE, MAINTAIN AND REPAIR
THE FUEL SYSTEM

GS-01	Adjusting fuel/air mixtures and mechanical linkage	1	1
GS-02	Cleaning or replacing fuel and air filters	1	1
GS-03	Removing carburetor from engine	1	2
GS-04	Disassembling, cleaning and inspecting carburetor	2	4
GS-05	Reassembling and testing carburetor	4	6
GS-06	Testing and replacing fuel pump	1	3
GS-07	Servicing fuel tank, lines, hoses and fuel level monitoring devices	1	2
GS-08	Diagnosing fuel system problems	2	2
		<u>13</u>	<u>21</u>

DUTY B: SERVICE, MAINTAIN AND REPAIR
THE IGNITION SYSTEM

GS-09	Inspecting, selecting and installing spark plugs	1	2
GS-10	Timing the ignition	1	2
GS-11	Inspecting and replacing circuit wiring, distributor cap and rotor	1	3
GS-12	Testing, removing and replacing battery ignition components	2	4
GS-13	Testing, removing and replacing electronic ignition components	2	8
GS-14	Using and interpreting the ignition analyzer	2	8
GS-15	Diagnosing ignition system problems	1	3
		<u>10</u>	<u>30</u>

DUTY C: SERVICE, MAINTAIN AND REPAIR
EMISSIONS CONTROLS

GS-16	Measuring exhaust emissions	1	3
GS-17	Testing and replacing components in the positive crankcase ventilation (PCV) system	1	1
GS-18	Testing and replacing components in the fuel evaporative control system	1	3
GS-19	Testing and replacing components in the exhaust gas recirculation (EGP) system	2	2

IV-21

<u>Task</u>	<u>Title ..</u>	<u>Class Hours</u>	<u>Lab Hours</u>
GS-20	Testing and replacing the catalytic converter	1	3
GS-21	Testing and replacing components in the thermostatic air cleaner system	2	2
GS-22	Testing and replacing components in the air injection reaction (AIR) system	2	2
GS-23	Testing and replacing components in the spark control system	2	2
		<u>12</u>	<u>18</u>
	Total Quarter V Class and Lab Hours	97	215
	Total Quarter V Instructional Hours		312

<u>Quarter VI</u>			
<u>Task</u>	<u>Title</u>	<u>Class Hours</u>	<u>Lab Hours</u>
MAJOR BLOCK: DIESEL ENGINES			
DUTY A: <u>ENGINE OVERHAUL</u>			
DE-01	Testing to determine engine condition	10	15
DE-02	Performing major and minor tune-up	4	16
DE-03	Reconditioning cylinder head	5	15
DE-04	Performing an in-frame overhaul	5	25
DE-05	Performing bench overhaul	10	30
		<u>34</u>	<u>101</u>
DUTY B: <u>DIESEL ENGINE GOVERNORS</u>			
DE-06	Demonstrating governor principles of operation	4	6
DE-07	Using correct terminology (governors)	2	2
DE-08	Classifying governors	2	4
DE-09	Adjusting hydraulic governors	2	6
DE-10	Troubleshooting governors	2	6
		<u>12</u>	<u>24</u>
DUTY C: <u>FUEL INJECTION SYSTEMS</u>			
DE-11	Identifying diesel fuel system components	3	3
DE-12	Disassembling, inspecting and reassembling the jerk pump	3	6
DE-13	Testing and calibrating multiple plunger injection pump	4	20
DE-14	Testing and calibrating the distributor type fuel injection pumps	4	8
DE-15	Reconditioning and adjusting the fuel injectors	6	20
DE-16	Troubleshooting the Cummins PT fuel system	10	28
DE-17	Repairing blowers, turbochargers and superchargers	6	20
		<u>36</u>	<u>105</u>
Total Quarter VI Class and Lab Hours		82	230
Total Quarter VI Instructional Hours		312	

SECTION V

RECORDS

SECTION V

Section V Content List

Individualized Competency Record
Group Progress Chart

Section V presents suggested ways of recording and documenting the progress of students through the curriculum. The recommended procedures include options for both individual and group records. The very important function of communicating the student's qualifications to potential employers is handled clearly and efficiently by the use of the Certificate of Competency, which is also described in this section.

RECORDS MANAGEMENT

This guide provides a series of easy to use documents that will aid the instructor in recordkeeping and that will be beneficial to the student in entering the work force.

In addition to providing the instructor with an "at a glance" assessment of individual and/or group progress, a Certificate of Competency, which can be used by students seeking employment, is included.

The group progress chart reflects individual task completion of all students. Due to confidentiality of records, grades must not be recorded on the chart. A notation indicating task completion (i.e., x or check) should be used.

INSTRUCTIONS

Instructions

Competency Checklist

- 1) Enter the student's name.
- 2) Enter the date and instructor's initials as each unit of instruction is completed.

The Competency Checklist automatically indicates when all the requirements for each DOT exit point or job title have been completed by the student. At each point on the certificate where an asterisk appears, the student is eligible to receive a Certificate of Competency.

Certificate of Competency

A Certificate of Competency is to be issued for each job title for which a student is qualified.

- 1) Enter the student's name.
- 2) Enter the school's name
- 3) Sign and date the form.

A Certificate of Competency may be issued at the time a student qualifies for it, or all certificates for which a student qualifies may be issued to the student when he/she completes or leaves the program.

Group Progress Chart

- 1) Enter all program tasks across top of matrix.
- 2) Enter the students' names down the left hand side of matrix.
- 3) As each student completes a task, a notation should be made in the square which corresponds with the task and the student's name.

COMPETENCY CHECKLIST

EXIT POINTS

PROGRAM: DIESEL MECHANICS

STUDENT NAME: _____

TASK NO.	UNIT COMPETENCIES	DATE	IN'T	DOT NO.	JOB TITLE	EXIT POINTS
				620.281-066	Tune-Up Mechanic	
				620.281-026	Brake Repairer	
				620.684-014	Auto Mechanic Helper (truck and bus)	
				620.261-010	Auto Mechanic (truck and bus)	
				625.684-010	Diesel Mechanic Helper	
				625.281-010	Diesel Mechanic	
				625.281-022	Fuel Injection Servicer	
RI-01	<u>RELATED INSTRUCTION</u> Demonstrating and utilizing school and shop policies and procedures					X X X X X X X
RI-02	Maintaining a parts inventory					X X X X X X X
RI-03	Reading and interpreting the shop service manuals					X X X X X X X
RI-04	Completing job work order forms					X X X X X X X
RI-05	Identifying and maintaining shop tools and equipment					X X X X X X X
RI-06	Using precision measurement tools and equipment					X X X X X X X
RI-07	Demonstrating engine theories of operation					X X X X X X X
RI-08	Demonstrating a knowledge of electricity fundamentals					X X X X X X X
RI-09	Demonstrating a knowledge of fuels					X X X X X X X
RI-10	Demonstrating a knowledge of lubricants					X X X X X X X
RI-11	Demonstrating a knowledge of hardware and fasteners					X X X X X X X
RI-12	Demonstrating basic metal operations					X X X X X X X
RI-13	Demonstrating welding and soldering techniques					X X X X X X X
RI-14	Demonstrating a knowledge of applied mathematics					X X X X X X X
RI-15	Demonstrating a knowledge of applied science					X X X X X X X
RI-16	Non-destructive testing of engine parts					X X X X X X X
HD-01	<u>PERFORM SERVICE CHECKS</u> Checking and changing engine oil and oil filter					X X X X X X
HD-02	Checking fluid level and refilling transmission and rear end					X X X X X X
HD-03	Lubricating chassis and components					X X X X X X
HD-04	Checking and replacing windshield wiper blades					X X X X X X
HD-05	Repairing tires and tubes					X X X X X X
HD-06	Replacing light bulbs and fuses					X X X X X X X
HD-07	Washing and waxing vehicle					X X X X X X
HD-08	Performing state inspection					X X X X X X
HD-09	<u>SERVICE, MAINTAIN AND REPAIR THE STARTING SYSTEM</u> Servicing battery and cables					X X X X X
HD-10	Replacing and rebuilding solenoids and switches					X X X X X
HD-11	Removing and replacing the starter					X X X X X
HD-12	Disassembling and inspecting the starter components					X X X X
HD-13	Reconditioning the starter components					X X X
HD-14	Reassembling the starter					X X X
HD-15	Diagnosing starting system problems					X X X
HD-16	<u>SERVICE, MAINTAIN AND REPAIR THE CHARGING SYSTEM</u> Testing the DC generator and regulator					X X X X X
HD-17	Testing the alternator and regulator					X X X X
HD-18	Removing, disassembling and inspecting the generator					X X X
HD-19	Rebuilding the generator					X X
HD-20	Removing, disassembling and inspecting the alternator					X X
HD-21	Rebuilding the alternator					X X
HD-22	Removing and replacing generators and alternators					X X
HD-23	Diagnosing and charging system problems					X X

COMPETENCY CHECKLIST

EXIT POINTS

PROGRAM: DIESEL MECHANICS

STUDENT NAME: _____

TASK NO.	UNIT COMPETENCIES	DATE	IN'T.	DOT NO.	JOB TITLE	EXIT POINTS
	<u>SERVICE, MAINTAIN AND REPAIR THE HEATING AND COOLING SYSTEM</u>			620.281-066	Tune-Up Mechanic	
HD-24	Checking coolant level and freezing point			620.281-026	Brake Repairer	
HD-25	Cleaning and flushing the system			620.684-014	Auto Mechanic Helper (truck and bus)	
HD-26	Inspecting, adjusting or replacing fan belts and hoses			620.261-010	Auto Mechanic (truck and bus)	
HD-27	Testing the system with pressure			625.684-010	Diesel Mechanic Helper	
HD-28	Removing, repairing and replacing the radiator or heat exchanger			625.281-010	Diesel Mechanic	
HD-29	Testing and replacing thermostats and radiator caps			625.281-022	Fuel Injection Servicer	
HD-30	Replacing the variable speed fan					
HD-31	Replacing the water pump					
HD-32	Repairing the heater controls					
HD-33	Removing, repairing and replacing the heater core					
HD-34	Diagnosing cooling system problems					
	<u>SERVICE, MAINTAIN AND REPAIR THE BRAKING SYSTEM</u>					
HD-35	Identifying brake system components					
HD-36	Adjusting brakes					
HD-37	Removing and rebuilding brake cylinders/air chambers					
HD-38	Removing and rebuilding brake calipers					
HD-39	Replacing brake shoes and pads					
HD-40	Machining brake drums					
HD-41	Machining brake rotors					
HD-42	Replacing hydraulic control or air valves and lines					
HD-43	Replacing power brake units					
HD-44	Diagnosing brake system problems					
	<u>SERVICE, MAINTAIN AND REPAIR THE SUSPENSION SYSTEM</u>					
HD-45	Identifying suspension system components					
HD-46	Inspecting suspension system components					
HD-47	Lubricating and adjusting front wheel bearings					
HD-48	Replacing shock absorbers					
HD-49	Replacing front coil springs and rear leaf springs					
HD-50	Changing and balancing wheels and tires					
HD-51	Replacing upper and lower control arms and bushings					
HD-52	Replacing upper and lower ball joints					
HD-53	Replacing king pins and bushings					
HD-54	Replacing torsion bars					
HD-55	Replacing twin I-beams					
HD-56	Diagnosing suspension system problems					
	<u>SERVICE, MAINTAIN AND REPAIR THE STEERING SYSTEM</u>					
HD-57	Identifying steering components					
HD-58	Adjusting manual steering gear					
HD-59	Inspecting and replacing steering gear linkage					
HD-60	Replacing power steering unit					
HD-61	Replacing steering column					
HD-62	Aligning the front end					
HD-63	Diagnosing steering problems					

COMPETENCY CHECKLIST

PROGRAM: DIESEL MECHANICS

EXIT POINTS

STUDENT NAME: _____

TASK NO.	UNIT COMPETENCIES	DATE	IN'T.	DOT NO.	JOB TITLE	630.281-066	630.281-026	630.684-014	630.261-010	635.684-010	635.281-010	635.281-022
	<u>SERVICE AND REPAIR THE EXHAUST SYSTEM</u>				Time-Up Mechanic							
HD-64	Identifying emissions control components				Brake Repairer	X						
HD-65	Removing and replacing exhaust pipes, mufflers and tail pipes				Auto Mechanic Helper (truck and bus)			X	X			
HD-66	Diagnosing emissions control and exhaust system problems				Auto Mechanic (truck and bus)					X	X	
	<u>TEST AND MAINTAIN ELECTRICAL CIRCUITS</u>				Diesel Mechanic Helper							
AC-01	Replacing wiring and making splices				Diesel Mechanic	X			X	X		
AC-02	Testing and maintaining electrical protection devices				Fuel Injection Services		X					
AC-03	Testing and repairing the courtesy light circuit											
AC-04	Testing and repairing the parking light and marker lamp circuits											
AC-05	Testing and repairing the back-up light circuit											
AC-06	Testing and repairing the headlight circuit											
AC-07	Testing and repairing the turn signal circuit											
AC-08	Testing and repairing the brake light circuit											
AC-09	Testing and repairing the horn circuit											
AC-10	Testing and repairing the windshield wiper circuit (air or electric)											
AC-11	Testing and repairing the windshield washer circuit											
AC-12	Testing and replacing instrument gauges and sending units											
AC-13	Testing and repairing the CB radio power circuit											
AC-14	Testing and trimming the radio antenna											
AC-15	Testing and repairing fog lights											
	<u>TEST AND MAINTAIN THE AIR CONDITIONING SYSTEM</u>											
AC-16	Testing system performance											
AC-17	Discharging the system											
AC-18	Evacuating and charging the system											
AC-19	Rebuilding compressors											
AC-20	Replacing refrigerant lines and accessories											
AC-21	Installing air conditioning units											
AC-22	Diagnosing air conditioning problems											
	<u>SERVICE, MAINTAIN AND REPAIR THE MANUAL TRANSMISSION</u>											
PT-01	Adjusting and repairing clutch and shift linkage											
PT-02	Removing and disassembling transmission											
PT-03	Inspecting and reassembling transmission											
PT-04	Removing and replacing clutch assembly											
PT-05	Removing and replacing flywheel ring gear											
PT-06	Diagnosing manual transmission problems											
	<u>SERVICE, MAINTAIN AND REPAIR THE DRIVE LINE AND DIFFERENTIAL</u>											
PT-07	Inspecting the drive shaft											
PT-08	Removing and replacing universal joints											

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COMPETENCY CHECKLIST

EXIT POINTS

PROGRAM: DIESEL MECHANICS

STUDENT NAME: _____

TASK NO.	UNIT COMPETENCIES	DATE	IN'T.	DOT NO.	JOB TITLE	EXIT POINTS
PT-09	Removing and replacing constant velocity joints			620.281-066	Tune-Up Mechanic	
PT-10	Removing and replacing rear axle bearings			620.281-026	Brake Repairer	
PT-11	Removing and disassembling differential assembly			620.684-014	Auto Mechanic Helper (truck and bus)	
PT-12	Inspecting and reassembling differential assembly			620.261-010	Auto Mechanic (truck and bus)	
PT-13	Removing and replacing front drive axle assembly			625.684-010	Diesel Mechanic Helper	
PT-14	Rebuilding the four wheel drive locking hubs			625.281-010	Diesel Mechanic	
PT-15	Rebuilding the four wheel drive transfer case			625.281-022	Fuel Injection Servicer	
PT-16	Diagnosing drive line and rear end problems					
<u>SERVICE, MAINTAIN AND REPAIR THE AUTOMATIC TRANSMISSION</u>						
PT-17	Testing the automatic transmission					X
PT-18	Inspecting and adjusting shift linkage					X
PT-19	Removing and replacing the transmission oil filter					X
PT-20	Testing and replacing the vacuum modulator					X
PT-21	Removing and disassembling transmission					X
PT-22	Inspecting and reassembling transmission					X
PT-23	Testing transmission on bench					X
PT-24	Removing and replacing torque					X
PT-25	Diagnosing automatic transmission problems					X
<u>INTERNAL COMBUSTION ENGINE OVERHAUL</u>						
IC-01	Determining engine condition			X		X
IC-02	Identifying cylinder head component parts			X	X	X
IC-03	Adjusting the valves			X	X	X
IC-04	Removing the cylinder head			X	X	X
IC-05	Removing and inspecting valves			X	X	X
IC-06	Refacing the valves and valve stems			X	X	X
IC-07	Inspecting the cylinder head			X	X	X
IC-08	Grinding the valve seats			X	X	X
IC-09	Servicing the rocker arm, push rod and lifter assemblies			X	X	X
IC-10	Reassembling and replacing the cylinder head(s)			X	X	X
IC-11	Diagnosing problems in the valve train			X	X	X
<u>REPLACE TIMING CHAIN AND/OR GEARS (ENGINE IN VEHICLE)</u>						
IC-12	Removing component parts			X	X	X
IC-13	Removing vibration damper			X	X	X
IC-14	Removing front cover			X	X	X
IC-15	Removing and replacing timing chain(s) and/or gears			X	X	X
IC-16	Replacing front cover and seal			X	X	X
IC-17	Diagnosing timing chain problems			X	X	X
<u>INSTALL A SHORT BLOCK ASSEMBLY</u>						
IC-18	Removing engine from vehicle			X	X	X
IC-19	Removing and inspecting usable parts			X	X	X
IC-20	Assembling new and used parts on block assembly			X	X	X
IC-21	Installing engine assembly			X	X	X
IC-22	Testing engine assembly			X	X	X
IC-23	Diagnosing internal engine failure			X	X	X

COMPETENCY CHECKLIST

EXIT POINTS

PROGRAM: DIESEL MECHANICS

STUDENT NAME: _____

TASK NO.	UNIT COMPETENCIES	DATE	IN'T.	DOT NO.	JOB TITLE	EXIT POINTS
				630.281-066	Tune-Up Mechanic	
				630.281-026	Brake Repairer	
				630.684-014	Auto Mechanic Helper (truck and bus)	
				630.261-010	Auto Mechanic (truck and bus)	
				635.684-010	Diesel Mechanic Helper	
				635.281-010	Diesel Mechanic	
				635.281-022	Fuel Injection Servicer	
	<u>REBUILD ENGINE BLOCK ASSEMBLY</u>					
IC-24	Disassembling an internal combustion engine					X
IC-25	Cleaning and inspecting block and components					X
IC-26	Preparing cylinder block					X
IC-27	Installing cam bearings					X
IC-28	Installing piston pins and rings					X
IC-29	Installing crankshaft					X
IC-30	Installing liners, pistons and rod bearings					X
IC-31	Installing oil pump, oil pan and component parts					X
	<u>SERVICE, MAINTAIN AND REPAIR THE FUEL SYSTEM</u>					
GS-01	Adjusting fuel/air mixtures and mechanical linkage			X		X
GS-02	Cleaning or replacing fuel and air filters			X		X
GS-03	Removing carburetor from engine			X	X	X
GS-04	Disassembling, cleaning and inspecting carburetor			X	X	X
GS-05	Reassembling and testing carburetor			X	X	X
GS-06	Testing and replacing fuel pump			X		X
GS-07	Servicing fuel tank, lines, hoses and fuel level monitoring devices			X		X
GS-08	Diagnosing fuel system problems			X		X
	<u>SERVICE, MAINTAIN AND REPAIR THE IGNITION SYSTEM</u>					
GS-09	Inspecting, selecting and installing spark plugs			X	X*	X
GS-10	Timing the ignition			X		X
GS-11	Inspecting and replacing circuit wiring, distributor cap and rotor			X		X
GS-12	Testing, removing and replacing battery ignition components			X		X
GS-13	Testing, removing and replacing electronic ignition components			X		X
GS-14	Using and interpreting the ignition analyzer			X		X
GS-15	Diagnosing ignition system problems			X		X
	<u>SERVICE, MAINTAIN AND REPAIR EMISSION CONTROLS</u>					
GS-16	Measuring exhaust emissions			X		X
GS-17	Testing and replacing components in the positive crankcase ventilation (PVC) system			X		X
GS-18	Testing and replacing components in the fuel evaporative control system			X		X
GS-19	Testing and replacing components in the exhaust gas recirculation (EGR) system			X		X
GS-20	Testing and replacing the catalytic converter			X		X
GS-21	Testing and replacing components in the thermostatic air cleaner system			X		X
GS-22	Testing and replacing components in the air injection reaction (AIR) system			X		X
GS-23	Testing and replacing components in the spark plug control system			X*		X*
	<u>ENGINE OVERHAUL</u>					
DE-01	Testing to determine engine condition					X X

COMPETENCY CHECKLIST

EXIT POINTS

PROGRAM: DIESEL MECHANICS

STUDENT NAME: _____

TASK NO.	UNIT COMPETENCIES	DATE	IN'T.	DOT NO.	JOB TITLE	620.281-066	620.281-026	620.684-014	620.261-010	625.684-010	625.281-010	625.281-022
DE-02	Performing major and minor tune-up				Tune-Up Mechanic							
DE-03	Reconditioning cylinder head				Brake Repairer							
DE-04	Performing an in-frame overhaul				Auto Mechanic Helper (truck and bus)							
DE-05	Performing bench overhaul				Auto Mechanic (truck and bus)							
	<u>DIESEL ENGINE GOVERNORS</u>				Diesel Mechanic Helper							
DE-06	Demonstrating governor principles of operation				Diesel Mechanic							
DE-07	Using correct terminology (governors)											
DE-08	Classifying governors											
DE-09	Adjusting hydraulic governors											
DE-10	Troubleshooting governors											
	<u>FUEL INJECTION SYSTEMS</u>											
DE-11	Identifying diesel fuel system components											
DE-12	Disassembling, inspecting and reassembling the jerk pump											
DE-13	Testing and calibrating multiple plunger injection pump											
DE-14	Testing and calibrating the distributor type fuel injection pumps											
DE-15	Reconditioning and adjusting the fuel injectors											
DE-16	Troubleshooting the Cummins PT fuel system											
DE-17	Repairing blowers, turbochargers and superchargers											

This is to certify that the above named student has demonstrated proficiency in the performance of the tasks and/or competencies indicated above. These tasks and/or competencies have been determined to be the skills and knowledge that are necessary for entry level employment into the job classification indicated.

Date _____ Instructor _____
 School _____
 Instructor _____
 Instructor _____
 Instructor _____

CERTIFICATE OF COMPETENCY

This is to Certify that

Justin Patrick Maloney

of

Anna Maria Lech

has successfully mastered the competencies required to perform the job of

BRAKE REPAIRER

James A. Watkins
September 18, 1981

V-13

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Brake Repairer.

BRAKE REPAIRER
D.O.T. CODE 620.281-026

Related Instruction

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manuals
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measuring tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter

Checking fluid level and refilling transmission and rear end
Lubricating chassis and components
Checking and replacing windshield wiper blades
Repairing tires and tubes
Replacing light bulbs and fuses
Washing and waxing vehicle
Performing state inspection

Service, Maintain and Repair the Braking System

Identifying brake system components
Adjusting brakes

Service, Maintain and Repair the Suspension System

Identifying suspension system components
Inspecting suspension system components
Lubricating and adjusting front wheel bearings
Replacing shock absorbers
Replacing front coil springs and rear leaf springs
Changing and balancing wheels and tires

Service, Maintain and Repair the Steering System

Identifying steering components
Adjusting manual steering gear

CERTIFICATE OF COMPETENCY

This is to Certify that

of

has successfully mastered the competencies required to perform the job of

TUNE-UP MECHANIC

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Tune-Up Mechanic.

TUNE-UP MECHANIC
D.O.T. CODE 620.281-066

Related Instruction

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manuals
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measuring tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter
Checking fluid level and refilling transmission and rear end
Lubricating chassis and components
Checking and replacing windshield wiper blades
Replacing light bulbs and fuses
Washing and waxing vehicle
Performing state inspection

Service, Maintain and Repair the Starting System

Servicing battery and cables
Replacing and rebuilding solenoids and switches
Removing and replacing the starter
Disassembling and inspecting the starter components

Reconditioning the starter components
Reassembling and testing the starter
Diagnosing starting system problems

Service, Maintain and Repair the Charging System

Testing the DC generator and regulator
Testing the alternator and regulator
Removing, disassembling and inspecting the generator
Rebuilding the generator
Removing, disassembling and inspecting the alternator
Rebuilding the alternator
Removing and replacing generators and alternators
Diagnosing and charging system problems

Service, Maintain and Repair the Heating and Cooling System

Checking coolant level and freezing point
Cleaning and flushing the system
Inspecting, adjusting or replacing fan belts and hoses
Testing system with pressure
Removing, repairing and replacing the radiator or heat exchanger
Testing and replacing thermostats and radiator caps
Replacing the variable speed fan
Replacing the water pump

Service and Repair the Exhaust System

Identifying emission control components

Test and Maintain Electrical Circuits

Replacing wiring and making splices
Testing and maintaining electrical protection devices

Recondition Valves

Determining engine condition
Identifying cylinder head component parts
Adjusting the valves

Service, Maintain and Repair the Fuel System

Adjusting fuel/air mixtures and mechanical linkage
Cleaning or replacing fuel and air filters
Removing carburetor from engine
Disassembling, cleaning and inspecting carburetor
Reassembling and testing carburetor
Testing and replacing fuel pump
Servicing fuel tank, lines, hoses and fuel level monitoring devices
Diagnosing fuel system problems

Service, Maintain and Repair the Ignition System

Inspecting, selecting and installing spark plugs
Timing the ignition
Inspecting and replacing circuit wiring, distributor cap and rotor
Testing, removing and replacing battery ignition components
Testing, removing and replacing electronic ignition components
Using and interpreting the ignition analyzer
Diagnosing ignition system problems

Service, Maintain and Repair Emissions Controls

Measuring exhaust emissions
Testing and replacing components in the positive crankcase ventilation (PVC) system
Testing and replacing components in the fuel evaporative control system
Testing and replacing components in the exhaust gas recirculation (EGR) system
Testing and replacing the catalytic converter
Testing and replacing components in the thermostatic air cleaner system
Testing and replacing components in the air injection reaction (AIR) system
Testing and replacing components in the spark control system

CERTIFICATE OF COMPETENCY

This is to Certify that

of

has successfully mastered the competencies required to perform the job of

BRAKE REPAIRER

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Brake Repairer.

BRAKE REPAIRER
D.O.T. CODE 620.281-026

Related Instruction

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manuals
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measuring tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter

Checking fluid level and refilling transmission and rear end
Lubricating chassis and components
Checking and replacing windshield wiper blades
Repairing tires and tubes
Replacing light bulbs and fuses
Washing and waxing vehicle
Performing state inspection

Service, Maintain and Repair the Braking System

Identifying brake system components
Adjusting brakes

Service, Maintain and Repair the Suspension System

Identifying suspension system components
Inspecting suspension system components
Lubricating and adjusting front wheel bearings
Replacing shock absorbers
Replacing front coil springs and rear leaf springs
Changing and balancing wheels and tires

Service, Maintain and Repair the Steering System

Identifying steering components
Adjusting manual steering gear

CERTIFICATE OF COMPETENCY

This is to Certify that

of

has successfully mastered the competencies required to perform the job of

AUTO MECHANIC HELPER (TRUCK AND BUS)

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Auto Mechanic Helper (truck and bus).

AUTO MECHANIC HELPER (TRUCK AND BUS)
D.O.T. CODE 620.684-014

Related Instruction

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manuals
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measurement tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter
Checking fluid level and refilling transmission and rear end
Lubricating chassis and components
Checking and replacing windshield wiper blades
Repairing tires and tubes
Replacing light bulbs and fuses

Washing and waxing vehicle
Performing state inspection

Service, Maintain and Repair the Starting System

Servicing battery and cables
Replacing and rebuilding solenoids and switches
Removing and replacing the starter

Service, Maintain and Repair the Charging System

Testing the DC generator and regulator
Testing the alternator and regulator
Removing and replacing generators and alternators

Service, Maintain and Repair the Heating and Cooling System

Checking coolant level and freezing point
Cleaning and flushing the system
Inspecting, adjusting or replacing fan belts and hoses
Testing system with pressure
Testing and replacing thermostats and radiator caps

Service, Maintain and Repair the Braking System

Identifying brake system components
Adjusting brakes

Service, Maintain and Repair the Suspension System

Identifying suspension system components
Inspecting suspension system components

Lubricating and adjusting front wheel bearings
Replacing shock absorbers
Replacing front coil springs and rear leaf springs
Changing and balancing wheels and tires

Service, Maintain and Repair the Steering System

Identify steering components
Adjusting manual steering gear

Service and Repair the Exhaust System

Identifying emission control components
Removing and replacing exhaust pipes, mufflers and tail pipes

Recondition Valves

Identifying cylinder head component parts
Adjusting the valves
Removing the cylinder head

Rebuild Engine Block Assembly

Disassembling an internal combustion engine

Service, Maintain and Repair the Fuel System

Cleaning or replacing fuel and air filters
Removing carburetor from engine

Service, Maintain and Repair the Ignition System

Inspecting, selecting and installing spark plugs

CERTIFICATE OF COMPETENCY

This is to Certify that

of

has successfully mastered the competencies required to perform the job of

AUTO MECHANIC (TRUCK AND BUS)

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Auto Mechanic (truck and bus).

AUTO MECHANIC (TRUCK AND BUS)
D.O.T. CODE 620.261-010

Related Instruction

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manuals
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measurement tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter
Checking fluid level and refilling transmission and rear end
Lubricating chassis and components
Checking and replacing windshield wiper blades
Repairing tires and tubes
Replacing light bulbs and fuses
Washing and waxing vehicle
Performing state inspection

Service, Maintain and Repair the Starting System

Servicing battery and cables
Replacing and rebuilding solenoids and switches
Removing and replacing the starter
Disassembling and inspecting the starter components

Replacing upper and lower control arms and bushings
Replacing upper and lower ball joints
Replacing king pins and bushings
Replacing torsion bars
Replacing twin I-beams
Diagnosing suspension system problems

Service, Maintain and Repair the Steering System

Identifying steering components
Adjusting manual steering gear
Inspecting and replacing steering gear linkage
Replacing power steering unit
Replacing steering column
Aligning the front end
Diagnosing steering problems

Service and Repair the Exhaust System

Identifying emission control components
Removing and replacing exhaust pipes, mufflers and tail pipes
Diagnosing emissions control and exhaust system problems

Test and Maintain Electrical Circuits

Replacing wiring and making splices
Testing and maintaining electrical protection devices
Testing and repairing the courtesy light circuit
Testing and repairing the parking light and marker lamp circuits
Testing and repairing the back-up light circuit
Testing and repairing the headlight circuit
Testing and repairing the turn signal circuit
Testing and repairing the brake light circuit
Testing and repairing the horn circuit
Testing and repairing the windshield wiper circuit (air or electric)
Testing and repairing the windshield washer circuits

Recondition Valves

Determining engine condition
Identifying cylinder head component parts
Adjusting the valves
Removing the cylinder head
Removing and inspecting valves
Refacing the valves and valve stems
Inspecting the cylinder head
Grinding the valve seats
Servicing the rocker arm, push rod and lifter assemblies
Reassembling and replacing the cylinder head(s)
Diagnosing problems in the valve train

Replace Timing Chain and/or Gears (Engine in Vehicle)

Removing component parts
Removing vibration damper
Removing front cover
Removing and replacing timing chain(s) and/or gears
Replacing front cover seal
Diagnosing timing chain problems

Install a Short Block Assembly

Removing engine from vehicle
Removing and inspecting usable parts
Assembling new and used parts on block assembly
Installing engine assembly
Testing engine assembly
Diagnosing internal engine failure

Rebuild Engine Block Assembly

Disassembling an internal combustion engine
Cleaning and inspecting block and components
Preparing cylinder block
Installing cam bearings
Installing piston pins and rings
Installing crankshaft
Installing liners, pistons and rod bearings
Installing oil pump, oil pan and component parts

Reconditioning the starter components
Reassembling and testing the starter
Diagnosing starting system problems

Service, Maintain and Repair the Charging System

Testing the DC generator and regulator
Testing the alternator and regulator
Removing, disassembling and inspecting the generator
Rebuilding the generator
Removing, disassembling and inspecting the alternator
Rebuilding the alternator
Removing and replacing generators and alternators
Diagnosing and charging system problems

Service, Maintain and Repair the Heating and Cooling System

Checking coolant level and freezing point
Cleaning and flushing the system
Inspecting, adjusting or replacing fan belts and hoses
Testing system with pressure
Removing, repairing and replacing the radiator or heat exchanger
Testing and replacing thermostats and radiator caps
Replacing the variable speed fan
Replacing the water pump
Repairing the heater controls
Removing, repairing and replacing the heater core
Diagnosing cooling system problems

Service, Maintain and Repair the Braking System

Identifying brake system components
Adjusting brakes
Removing and rebuilding brake cylinders/air chambers
Removing and rebuilding brake calipers
Replacing brake shoes and pads
Machining brake drums
Machining brake rotors
Replacing hydraulic control or air valves and lines
Replacing power brake units
Diagnosing brake system problems

Service, Maintain and Repair the Suspension System

Identifying suspension system components

Inspecting suspension system components
Lubricating and adjusting front wheel bearing
Replacing shock absorbers
Replacing front coil springs and rear leaf springs
Changing and balancing wheels and tires
Testing and replacing instrument gauges and sending units
Testing and repairing the CB radio power circuit
Testing and trimming the radio antenna
Testing and repairing fog lights

Test and Maintain the Air Conditioning System

Testing system performance
Discharging the system
Evacuating and charging the system
Rebuilding compressors
Replacing refrigerant lines and accessories
Installing air conditioning units
Diagnosing air conditioning problems

Service, Maintain and Repair the Manual Transmission

Adjusting and repairing clutch and shift linkage
Removing and disassembling transmission
Inspecting and reassembling transmission
Removing and replacing clutch assembly
Removing and replacing flywheel ring gear
Diagnosing manual transmission problems

Service, Maintain and Repair the Drive Line and Differential

Inspecting the drive shaft
Removing and replacing universal joints
Removing and replacing constant velocity joints
Removing and replacing rear axle bearings
Removing and disassembling differential assembly
Inspecting and reassembling differential assembly
Removing and replacing front drive axle assembly
Rebuilding the four wheel drive locking hubs
Rebuilding the four wheel drive transfer case
Diagnosing drive line and rear end problems

Service, Maintain and Repair the Automatic Transmission

Testing the automatic transmission

Inspecting and adjusting shift linkage
Removing and replacing the transmission oil filter
Testing and replacing the vacuum modulator
Removing and disassembling transmission
Inspecting and reassembling transmission
Testing transmission on bench
Removing and replacing torque
Diagnosing automatic transmission problems

Service, Maintain and Repair the Fuel System

Adjusting fuel/air mixtures and mechanical linkage
Cleaning or replacing fuel and air filters
Removing carburetor from engine
Disassembling, cleaning and inspecting carburetor
Reassembling and testing carburetor
Testing and replacing fuel pump
Servicing fuel tank, lines, hoses and fuel level monitoring devices
Diagnosing fuel system problems

Service, Maintain and Repair the Ignition System

Inspecting, selecting and installing spark plugs
Timing the ignition
Inspecting and replacing circuit wiring, distributor cap and rotor
Testing, removing and replacing battery ignition components
Testing, removing and replacing electronic ignition components
Using and interpreting the ignition analyzer
Diagnosing ignition system problems

Service, Maintain and Repair Emissions Controls

Measuring exhaust emissions
Testing and replacing components in the positive crankcase ventilation (PVC) system
Testing and replacing components in the fuel evaporative control system
Testing and replacing components in the exhaust gas recirculation (EGR) system
Testing and replacing the catalytic converter
Testing and replacing components in the thermostatic air cleaner system
Testing and replacing components in the air injection reaction (AIR) system
Testing and replacing components in the spark control system

CERTIFICATE OF COMPETENCY

This is to Certify that

of

has successfully mastered the competencies required to perform the job of

DIESEL MECHANIC HELPER

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Diesel Mechanic Helper.

DIESEL MECHANIC HELPER
D.O.T. CODE 625.664-010

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manuals
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measurement tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter
Checking fluid level and refilling transmission and rear end
Lubricating chassis and components
Checking and replacing windshield wiper blades
Repairing tires and tubes
Replacing light bulbs and fuses
Washing and waxing vehicle
Performing state inspection

Service, Maintain and Repair the Starting System

Servicing battery and cables
Replacing and rebuilding solenoids and switches
Removing and replacing the starter

Service, Maintain and Repair the Charging System

Testing the DC generator and regulator
Testing the alternator and regulator
Removing and replacing generators and alternators

Service, Maintain and Repair the Heating and Cooling System

Checking coolant level and freezing point
Cleaning and flushing the system
Inspecting, adjusting or replacing fan belts and hoses
Testing system with pressure
Testing and replacing thermostats and radiator caps

Service and Repair the Exhaust System

Identifying emission control components

Recondition Valves

Identifying cylinder head component parts
Adjusting the valves

Rebuild Engine Block Assembly

Disassembling an internal combustion engine

Service, Maintain and Repair the Fuel System

Adjusting fuel/air mixtures and mechanical linkage
Cleaning or replacing fuel and air filters

CERTIFICATE OF COMPETENCY

This is to Certify that

of

has successfully mastered the competencies required to perform the job of

DIESEL MECHANIC

V-27

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Diesel Mechanic.

DIESEL MECHANIC
D.O.T. CODE 625.281-010

Related Instruction

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manuals
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measurement tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter
Checking fluid level and refilling transmission and rear end
Lubricating chassis and components
Checking and replacing windshield wiper blades
Repairing tires and tubes
Replacing light bulbs and fuses
Washing and waxing vehicle
Performing state inspection

Service, Maintain and Repair the Starting System

Servicing battery and cables
Replacing and rebuilding solenoids and switches
Removing and replacing the starter
Disassembling and inspecting the starter components

Rebuilding the alternator
Removing and replacing generators and alternators
Diagnosing and charging system problems

Service, Maintain and Repair the Heating and Cooling System

Checking coolant level and freezing point
Cleaning and flushing the system
Inspecting, adjusting or replacing fan belts and hoses
Testing system with pressure
Removing, repairing and replacing the radiator or heat exchanger
Testing and replacing thermostats and radiator caps
Replacing the variable speed fan
Replacing the water pump
Repairing the heater controls
Removing, repairing and replacing the heater core
Diagnosing cooling system problems

Service and Repair the Exhaust System

Identify emission control components
Diagnosing emissions control and exhaust system problems

Test and Maintain Electrical Circuits

Replacing wiring and making splices
Testing and maintaining electrical protection devices

Recondition Valves

Determining engine condition
Identifying cylinder head component parts
Adjusting the valves
Removing the cylinder head
Removing and inspecting valves
Refacing the valves and valve stems
Inspecting the cylinder head
Grinding the valve seats
Servicing the rocker arm, push rod and lifter assemblies
Reassembling and replacing the cylinder head(s)
Diagnosing problems in the valve train

Assembling new and used parts on block assembly
Installing engine assembly
Testing engine assembly
Diagnosing internal engine failure

Rebuild Engine Block Assembly

Disassembling an internal combustion engine
Cleaning and inspecting block and components
Preparing cylinder block
Installing cam bearings
Installing piston pins and rings
Installing crankshaft
Installing liners, pistons and rod bearings
Installing oil pump, oil pan and component parts

Service, Maintain and Repair the Fuel System

Adjusting fuel/air mixtures and mechanical linkage
Cleaning or replacing fuel and air filters
Testing and replacing fuel pump
Servicing fuel tank, lines, hoses and fuel level monitoring devices
Diagnosing fuel system problems

Service, Maintain and Repair Emissions Controls

Measuring exhaust emissions

Engine Overhaul

Testing to determine engine condition
Performing major and minor tune-up
Reconditioning cylinder head
Performing an in-frame overhaul
Performing bench overhaul

Diesel Engine Governors

Demonstrating governor principles of operation
Using correct terminology (governors)
Classifying governors
Adjusting hydraulic governors
Troubleshooting governors

Reconditioning the starter components
Reassembling and testing the starter
Diagnosing starting system problems

Service, Maintain and Repair the Charging System

Testing the DC generator and regulator
Testing the alternator and regulator
Removing, disassembling and inspecting the generator
Rebuilding the generator
Removing, disassembling and inspecting the alternator

Replace Timing Chain and/or Gears (Engine in Vehicle)

Removing component parts
Removing vibration damper
Removing front cover
Removing and replacing timing chain(s) and/or gears
Replacing front cover and seal
Diagnosing timing chain problems

Install a Short Block Assembly

Removing engine from vehicle
Removing and inspecting usable parts

Fuel Injection Systems

Identifying diesel fuel system components
Disassembling, inspecting and reassembling the jerk pump
Testing and calibrating the distributor type fuel injection pumps
Reconditioning and adjusting the fuel injectors
Troubleshooting the Cummins PT fuel system
Repairing blowers, turbochargers and superchargers

CERTIFICATE OF COMPETENCY

This is to Certify that

of

has successfully mastered the competencies required to perform the job of

FUEL INJECTION SERVICER

The student named on this certificate has demonstrated mastery of the following unit level competencies required to perform the job of Fuel Injection Servicer.

FUEL INJECTION SERVICER
D.O.T. CODE 625.281-022

Related Instruction

Demonstrating and utilizing school and shop policies and procedures
Maintaining a parts inventory
Reading and interpreting the shop service manual
Completing job work order forms
Identifying and maintaining shop tools and equipment
Using precision measurement tools and equipment
Demonstrating engine theories of operation
Demonstrating a knowledge of electricity fundamentals
Demonstrating a knowledge of fuels
Demonstrating a knowledge of lubricants
Demonstrating a knowledge of hardware and fasteners
Demonstrating basic metal operations
Demonstrating welding and soldering techniques
Demonstrating a knowledge of applied mathematics
Demonstrating a knowledge of applied science
Non-destructive testing of engine parts

Perform Service Checks

Checking and changing engine oil and oil filter
Replacing light bulbs and fuses

Service and Repair the Exhaust System

Identifying emission control components

Recondition Valves

Determining engine condition

Identifying cylinder head component parts
Adjusting the valves

Service, Maintain and Repair the Fuel System

Cleaning or replacing fuel and air filters
Testing and replacing fuel pump
Servicing fuel tank, lines, hoses and fuel level monitoring devices
Diagnosing fuel system problems

Engine Overhaul

Testing to determine engine condition
Performing major and minor tune-up

Diesel Engine Governors

Demonstrating governor principles of operation
Using correct terminology (governors)
Classifying governors
Adjusting hydraulic governors
Troubleshooting governors

Fuel Injection Systems

Identifying diesel fuel system components
Disassembling, inspecting and reassembling the jerk pump
Testing and calibrating multiple plunger injection pump
Testing and calibrating the distributor type fuel injection pumps
Reconditioning and adjusting the fuel injectors
Troubleshooting the Cummins PT fuel system
Repairing blowers, turbochargers and superchargers

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SECTION VI

FACILITIES

SECTION VI

Section VI Content List

Group Instruction Facilities
Individualized Instruction Facilities

The facility layouts on the following pages are presented to aid in arranging the classroom and laboratory for efficient instruction. The school administration and program instructor must determine an arrangement that best fits the needs of the students by determining the most efficient use of resources available to them not only in the laboratory, but also in the Learning Resource Center settings.

FACILITY LAYOUTS

The layouts on the following pages illustrate how facilities for group and individualized instructional programs may be planned and set up.

Each instructional approach has two important physical areas. These are (1) the laboratory (work) area and classroom for group instruction and (2) the laboratory (work) area and learning resource center (LRC) for individualized instruction.

The instructional setting for group instruction is based on that of a traditional classroom. This approach is easily set up and includes little or no modifications. The primary modes of learning are instructor lectures, occasional use of audiovisual aids and student participation. Ideally, all students progress at the same pace.

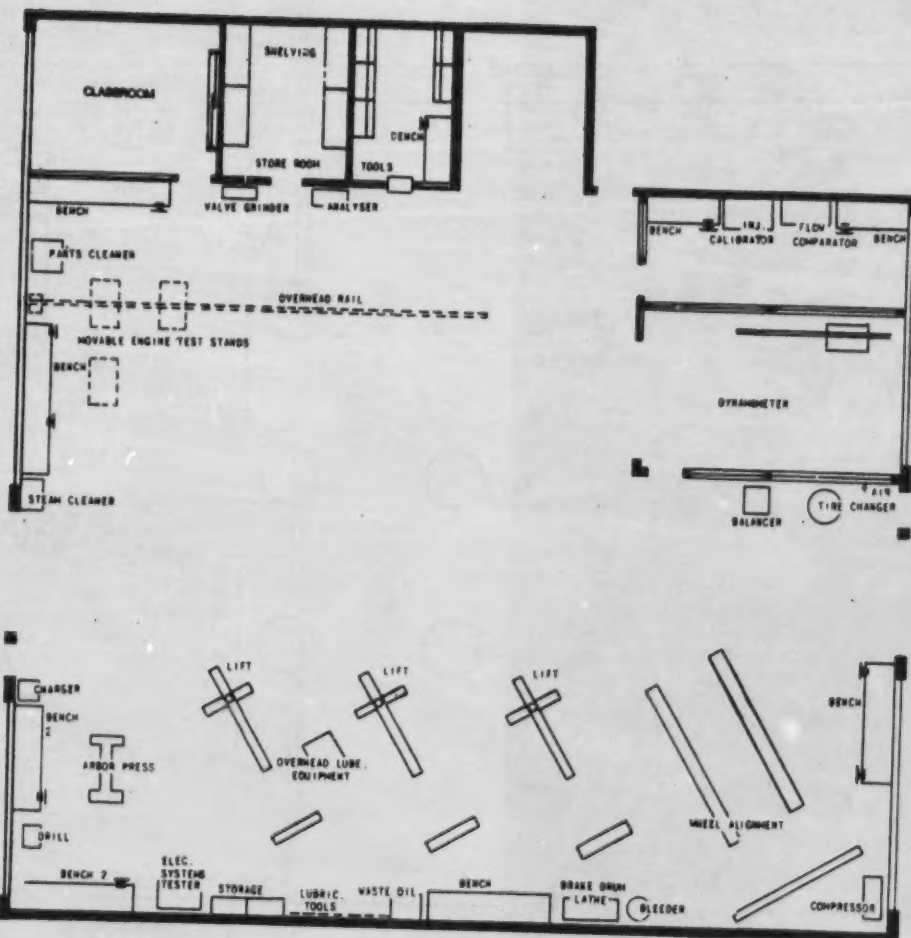
The instructional setting for individual instruction is designed to facilitate a student self-paced progression of learning. The LRC requires careful planning in utilizing available space. When planning to install an individual instruction program in an area not originally designed for this approach, the instructional setting may need modifications. Desks may be replaced with study carrels to allow students to simultaneously participate in a variety of learning activities. A group session area for small group gatherings should also be included. Because the instructor and students rarely meet together as a group, a bulletin board becomes a vital communication device in an LRC. It can be used to post announcements and such instructional information as group

progress charts, assignments, positions available in the industry and safety rules.

A variety of references, resources and media equipment should be made available to the student. Therefore, an adequate amount of storage area should be included in planning the LRC. Every specific school and department has unique physical layout characteristics and problems. Through innovation, these features may be transformed into LRC advantages rather than disadvantages.

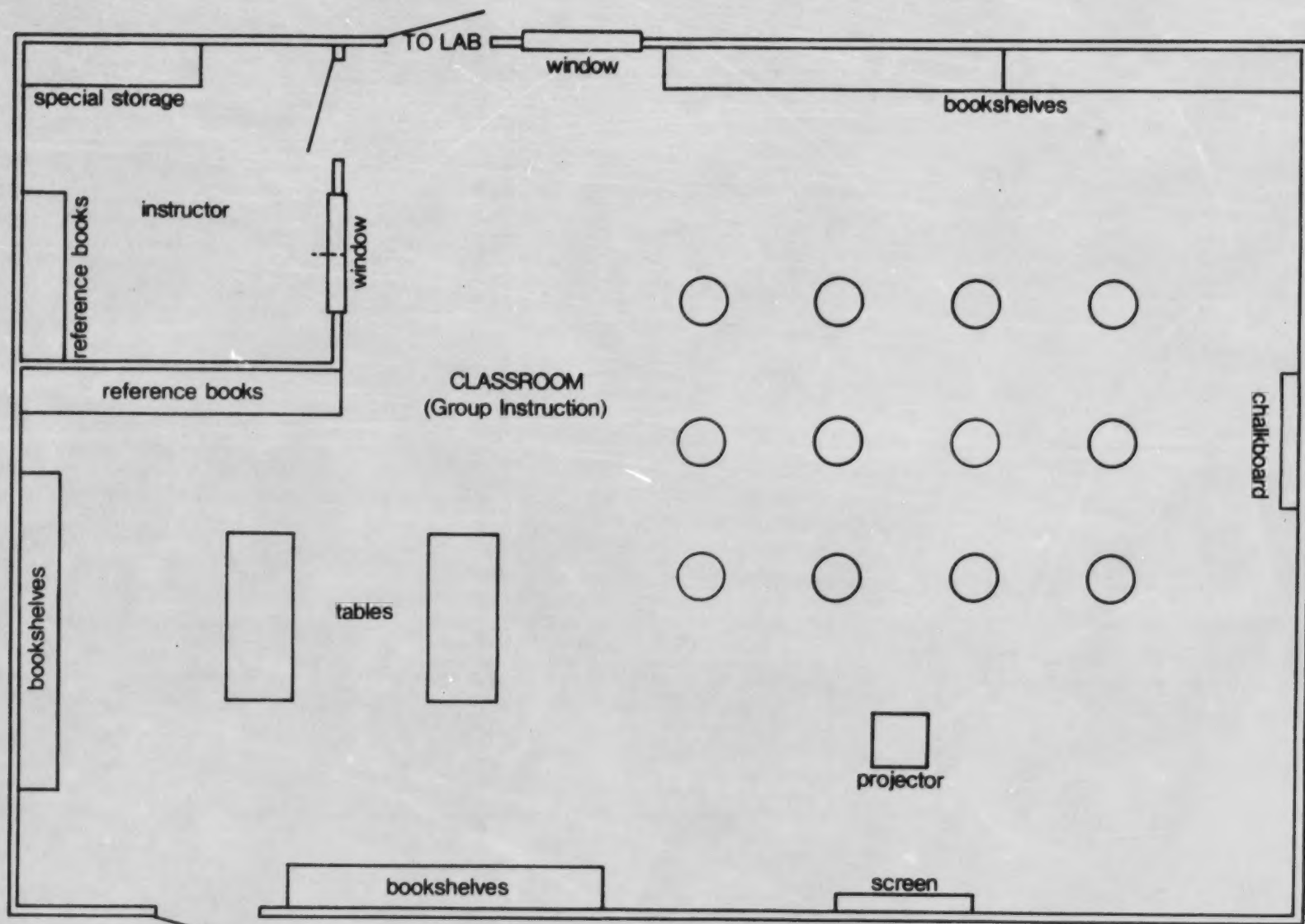
The manner in which the laboratory (work) area is planned and set up need not be affected by the type of instructional approach used by an instructor; it could/will be the same. Some major concerns in the laboratory are: 1) the instructor must always have a clear line of sight to each and every workstation, 2) tools must be accessible to students, but under the control of the instructor and 3) all supplies and materials required for the day's activities must be on hand and ready to use.

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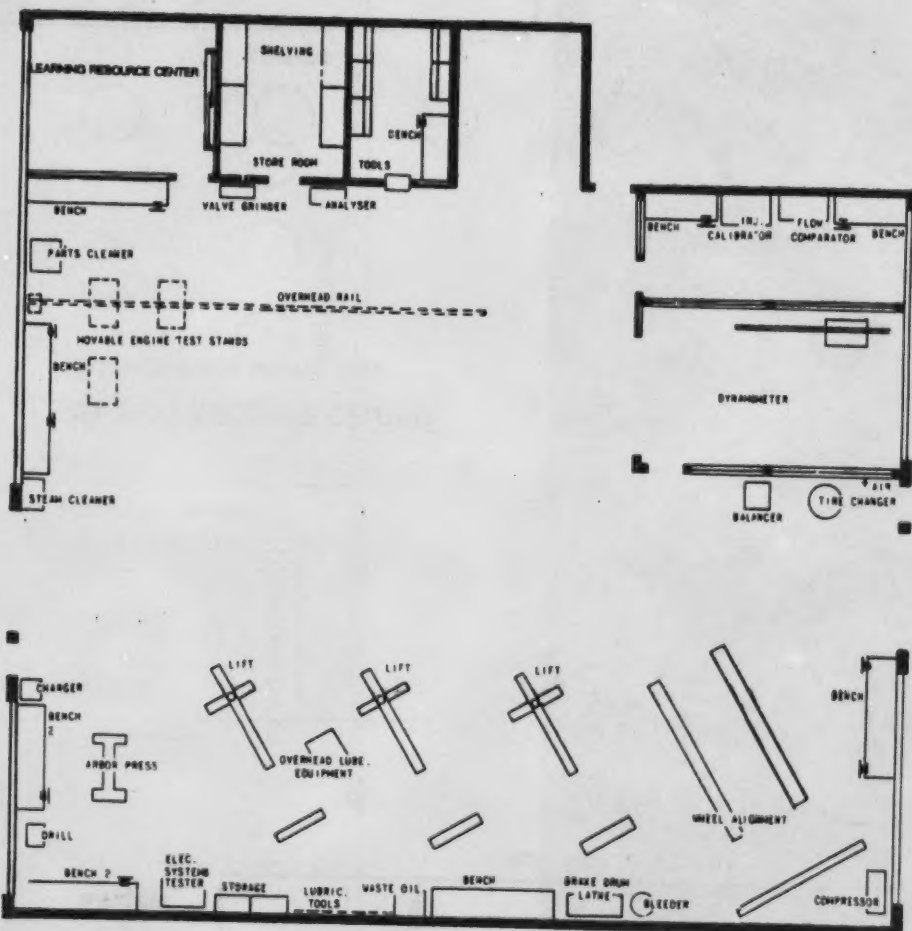


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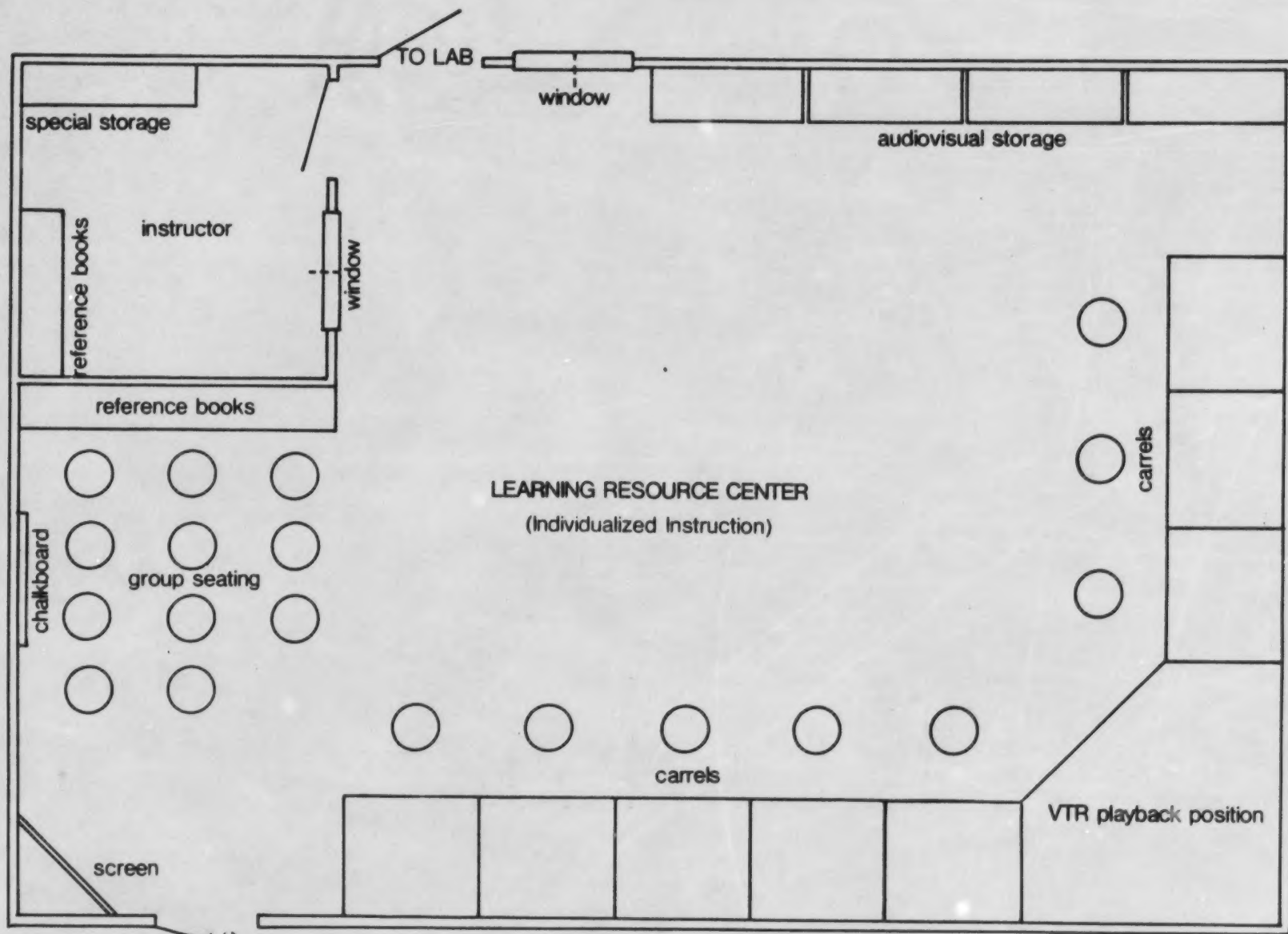
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APPENDIX A

Resources

RESOURCES

This appendix contains the instructional resource matrix, unit guide references, additional instructional materials and resource addresses.

The instructional resource matrix lists the audiovisuals, textbooks and student manuals for each task referenced on unit guide sheets. The audiovisual format is identified by symbols such as: filmstrip (FS), slide/script (SS), slide/tape (ST), 16mm movie film (MF), transparency (TR), video tape (VT) and filmloop (FL). The producer and title of the A/V is also given.

The unit guide bibliography lists textbooks, audiovisuals and student manuals and evaluation materials cited in the unit guides section.

The additional instructional materials is a compilation of textbooks not included in the unit guides but beneficial to educators.

Resource addresses for all references concludes this appendix.

CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
RI-01 Demonstrating and utilizing school and shop policies and safety procedures	AAVIM: "Developing Shop Safety Skills," (ST); Bergwall: "Shop Safety," (FS); Cummins: "Safety Film Checklist," (MF); "Diesel Race Car," (MF)	AAVIM: <u>Developing Shop Safety Skills</u> ; Ohio State University: <u>Shop Safety</u>	Georgia: <u>Auto Mechanics</u> , Units 101-1, 101-2, 101-3, 101-4; School Policies, Local Education Agency; AAVIM: <u>Developing Shop Safety Skills</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , A-II
RI-02 Maintaining a parts inventory		General Motors Corp.: <u>Aids To Educators</u>	
RI-03 Reading and interpreting the shop service manuals			
RI-04 Completing job work order forms			
RI-05 Identifying and maintaining shop tools and equipment	Bergwall: "Automotive Hand Tools Explained," (FS); Prentice-Hall: "Auto Mechanics Tools and Basic Skills," (FS)	Crouse and Anglin: <u>Automotive Tools, Fasteners and Measurements</u> ; Stockel: <u>Auto Mechanics Fundamentals</u>	Oklahoma: <u>Auto Mechanics</u> , Vol. I; MAVCC: <u>Diesel Engine Mechanics</u> , A-III
RI-06 Using precision measurement tools and equipment	Prentice-Hall: "Machine Shop Bench Operations," (FS); Cummins: "The Smallest Fraction," (MF)	Starrett: <u>How To Read, Use and Care for Micrometers and Vernier Gages</u> ; Stockel: <u>Auto Mechanics Fundamentals</u>	Georgia: <u>Metal Fabrication Cluster</u> , Unit M-1; MAVCC: <u>Diesel Engine Mechanics</u> , A-III

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
RI-07 Demonstrating internal combustion engine theories of operation	Bergwall: "The Internal Combustion Engine Explained," (FS); "The Four-cycle Diesel Engine Explained," (FS); Prentice-Hall: "The Introduction to the Diesel Engine," (FS); Cummins: "Engines," (MF)	Glenn: <u>Auto Mechanics</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u> ; Dagel: <u>Diesel Engine Repair</u>	MAVCC: <u>Diesel Engine Mechanics</u> , B-I
RI-08 Demonstrating a knowledge of electricity fundamentals	AAVIM: "Understanding Electricity and Electrical Terms," (SS); Prentice-Hall: "Basic Automotive Service," (FS); "Auto Mechanics Tools and Basic Skills," (FS); Cummins: "Watts a VOM," (MF)	AAVIM: <u>Understanding Electricity</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	MAVCC: <u>Diesel Engine Mechanics</u> , F-I
RI-09 Demonstrating a knowledge of fuels	Shell: "Refinery Processes," (MF); AAVIM: "Selecting and Storing Fuels and Lubricants," (SS/TR)	AAVIM: <u>Selecting and Storing Fuels and Lubricants</u> ; Crouse: <u>Automotive Mechanics</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u>	MAVCC: <u>Diesel Engine Mechanics</u> , B-II
RI-10 Demonstrating a knowledge of lubricants	Shell: "The Lubrication of Rolling Bearings," (MF)	Crouse: <u>Automotive Mechanics</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; Kates: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Section B, Unit III
RI-11 Demonstrating a knowledge of hardware and fasteners	Prentice-Hall: "Auto Mechanics Tools and Basic Skills," (FS)	Crouse and Anglin: <u>Automotive Tools, Fasteners and Measurements</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	MAVCC: <u>Diesel Engine Mechanics</u>

CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
RI-12 Demonstrating basic metal operations	Prentice-Hall: "Machine Shop: Bench Operations," (FS)		MAVCC: <u>Diesel Mechanics</u> , Section A, Unit III
RI-13 Demonstrating welding and soldering techniques	Delmar: "Basic Oxyacetylene Welding," (FS); Bergwall: "Cutting and Welding - Gas and Electric," (FS)	Althouse: <u>Modern Welding</u>	MAVCC, <u>Diesel Engine Mechanics</u> , H-I, II, III, IV
RI-14 Demonstrating a knowledge of applied mathematics	Prentice-Hall: "Metrics for Auto Mechanics," (FS)	Georgia: <u>Vocational Mathematics</u> ; Olivio: <u>Practical Problems in Mathematics for Specific Trades</u> ; Wilton and Rogers: <u>Shop Mathematics at Work</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	Georgia: <u>Vocational Mathematics</u>
RI-15 Demonstrating a knowledge of applied science		Crouse: <u>Automotive Mechanics</u> ; Jensen: <u>Related Science-Automotive Trades</u> ; Dagel: <u>Diesel Engine Repair</u>	AAVIM: <u>Ball and Roller Bearings</u>
RI-16 Non-destructive testing of engine parts	Bergwall: "How to Overhaul an Engine," (FS); Cummins: "Steel Parts Fractures Failure Analysis," (ST)	Stockel: <u>Auto Mechanic Fundamentals</u> ; Dagel: <u>Diesel Engine Repair</u>	

CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-01 Checking and changing engine oil and oil filter	Georgia: "Servicing Engine Lubricating System," (SS); Bergwall: "Lubrication Services," (FS); Prentice-Hall: "Basic Automotive Service," (FS)	Kates and Luck: <u>Diesel and High Compression Gas Engines</u> ; Remling: <u>Basics</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	Georgia: <u>Auto Mechanics, Unit 212-2</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-02 Checking fluid level and refilling transmission and rear end	Bergwall: "Lubrication Services," (FS); Prentice-Hall: "Basic Automotive Service," (FS)	Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Basics</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	Oklahoma: <u>Auto Mechanics II</u>
HD-03 Lubricating chassis and components	Bergwall: "Lubrication Services," (FS); Prentice-Hall: "Basic Automotive Service," (FS)	Remling: <u>Basics</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	
HD-04 Checking and replacing windshield wiper blades		Crouse: <u>Automotive Mechanics</u>	
HD-05 Repairing tires and tubes	Prentice-Hall: "Basic Automotive Service," (FS)	Stockel: <u>Auto Mechanic Fundamentals</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-06 Replacing light bulbs and fuses	Prentice-Hall: "Basic Automotive Service," (FS)	Remling: <u>Basics</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	Oklahoma: <u>Auto Mechanics II</u>
HD-07 Washing and waxing vehicle			Vehicle owner's manual

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-08 Performing state inspection		Crouse and Anglin: <u>Motor Vehicle Inspection</u> ; Rem-ling: <u>Basics</u>	Georgia Department of Safety: <u>Official Motor Vehicle Inspection Manual</u> ; Oklahoma: <u>Auto Mechanics I, II</u>
HD-09 Servicing battery and cables	Georgia: "Testing and Servicing Storage Battery," (SS/FS); Prentice-Hall: "Basic Automotive Service," (FS); "How the Automobile Works," (FS)	Crouse: <u>Automotive Mechan-ics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Me-chanic Fundamentals</u> ; Wet-zel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics</u> , Unit 201-4; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-II
HD-10 Replacing and re-building solenoids and switches	Bergwall: "Automotive Starting System Explained," (FS); Georgia: "Servicing Cranking System Controls," (SS/FS)	Crouse: <u>Automotive Mechan-ics</u> ; Dagel: <u>Diesel Engine Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 222-5; Oklahoma: <u>Auto Mechanics II</u>
HD-11 Removing and re-placing starters	Bergwall: "The Automotive Starting System Explained," (FS)	Crouse: <u>Automotive Mechan-ics</u> ; Stockel: <u>Auto Service and Repair</u> ; Wetzel: <u>Auto-motive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-III

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-12 Disassembling and inspecting the starting motor components	Georgia: "Overhauling Cranking Motors (Delco-Remy)," (SS); "Overhauling Cranking Motors (Ford Type)," (SS); "Overhauling Cranking Motors (Chrysler)," (SS); Bergwall: "The Starting System Explained," (FS); Ford: "Battery and Starting Systems," (SS); Prentice-Hall: "Servicing Automobile Electric Starters," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics</u> , Units 222-2, 222-3; Ford: <u>Battery and Starting System</u> , Student Text; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-III
HD-13 Reconditioning the starter components	Bergwall: "The Starting System Explained," (FS); Georgia: "Setting Coaster," (FL); "Setting Camber," (FL); "Setting Toe-in and Straight Ahead," (FL); "Inspecting and Aligning Front End," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-III
HD-14 Reassembling and testing the starter	Bergwall: "The Starting System Explained," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics</u> , Unit 223-2; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-III

CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-15 Diagnosing starting problems	Georgia: "Troubleshooting Cranking Systems," (FS); Bergwall: "Starting System Explained," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 222-1; Oklahoma: <u>Auto Mechanics II</u>
HD-16 Testing the DC generator and regulator	Georgia: "Testing, Setting and/or Replacing a DC Regulator," (SS); Prentice-Hall: "How the Automobile Works," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics</u> , Units 221-1, 221-5; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-V
HD-17 Testing the alternator and regulator	Georgia: "Testing Charging System (Conventional Type)," (SS); Ford: "Charging System-Alternator," (SS/TR)	Dagel: <u>Diesel Engine Repair</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 221-6; Ford: <u>Charging System-Alternator</u> , Student Text; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-VI
HD-18 Removing, disassembling and inspecting the generator		Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-V
HD-19 Rebuilding the generator	Georgia: "Overhauling a DC Generator," (SS); "Turning Armature and Undercutting Mica," (SS); "Bench Testing a DC Generator," (SS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics</u> , Units 221-2, 3, 4; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-V

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CURRICULUM AREA: DIESEL MECHANICS

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TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-20 Removing, disassembling and inspecting the alternator	Georgia: "Overhauling an A-C Generator (Conventional Type GM)," (SS); "Overhauling a Ford Motor Type," (SS); "Overhauling A-C Generator," (SS); "Testing and Rebuilding an Integrated General Motors Type A-C Generator," (SS); "Testing and Rebuilding a Transistorized Ford Type A-C Generator," (SS); Ford: "Charging System Alternator," (TR)	Dagel: <u>Diesel Engine Repair</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics</u> , Units 221-7, 8, 9; 261-4; Ford: <u>Charging System Alternator</u> , Student Text; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-VI
HD-21 Rebuilding the alternator	Georgia: "Overhauling a Ford Motor Type," (SS); "Overhauling A-C Generator," (SS); "Testing and Rebuilding an Integrated General Motors Type A-C Generator," (SS); "Testing and Rebuilding a Transistorized Ford Type A-C Generator," (SS); Ford: "Charging System Alternator," (TR)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	MAVCC: <u>Diesel Engine Mechanics</u> , F-VI
HD-22 Removing and replacing generators and alternators		Crouse: <u>Automotive Mechanics</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-VI

CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-23 Diagnosing charging system problems	Ford: "Charging System Diagnosis," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Ford: <u>Charging System Diagnosis, Student Text</u> ; Oklahoma: <u>Auto Mechanics II</u>
HD-24 Checking coolant level and freezing point	Georgia: "Servicing Cooling System," (SS); Bergwall: "The Automotive Cooling System Explained," (FS); "How to Service the Cooling System," (FS); Ford: "Cooling System Principles of Operation," (SS); Prentice-Hall: "How the Automobile Works," (FS)	Kates: <u>Diesel and High Compression Gas Engine</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 212-1</u> ; Ford: <u>Cooling System Principles of Operation, Student Text</u> ; Oklahoma: <u>Auto Mechanics I</u> ; MAVCC: <u>Diesel Engine Mechanics, B-IV</u>
HD-25 Cleaning and flushing the system	Bergwall: "Auto Cooling System Explained," (FS)	Kates and Luck: <u>Diesel and High Compression Gas Engines</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u> ; MAVCC: <u>Diesel Engine Mechanics, B-IV, D-II</u>
HD-26 Inspecting, adjusting or replacing fan belts and hoses	Bergwall: "Auto Cooling System Explained," (FS); Prentice-Hall: "Working with Hoses," (FS)	Stockel: <u>Auto Mechanic Fundamentals</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-27 Testing system with pressure	Cummins: "There's More to Cooling," (MF)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; Toboldt and Johnson: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , B-II
HD-28 Removing, repairing and replacing the radiator	Bergwall: "Auto Cooling System Explained," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-29 Testing and replacing thermostats and radiator caps	Bergwall: "Auto Cooling System Explained," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , D-II
HD-30 Replacing the variable speed fan	Bergwall: "The Auto Cooling System Explained," (FS)	Stockel: <u>Auto Service and Repair</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-31 Replacing the water pump	Bergwall: "The Auto Cooling System Explained," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , D-II

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-32 Repairing the heater controls		Stockel: <u>Auto Service and Repair</u> ; Toboldt and Johnson: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-33 Removing, repairing and replacing the heater core	Bergwall: "Auto Cooling System Explained," (FS)	Stockel: <u>Auto Service and Repair</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-34 Diagnosing engine heating and cooling system	Bergwall: "Auto Cooling System Explained," (FS)	Stockel: <u>Auto Service and Repair</u> ; Toboldt: <u>Automotive Encyclopedia</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u> ; Dagel: <u>Diesel Engine Repair</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-35 Identifying the brake system components	Georgia: "Checking Brake System Condition and Operation," (SS); Ford: "Evolution of Brakes," (FS); Bergwall: "Automatic Brakes Explained," (FS)	Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Brakes</u> ; Stockel: <u>Auto Service and Repair</u> ; Auto Mechanic Fundamentals; Tolboldt and Johnson: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics, Unit 231-1</u> ; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-36 Adjusting brakes	Georgia: "Checking Brake System Condition and Operation," (SS); Bergwall: "Automatic Brakes Explained," (FS)	Stockel: <u>Auto Mechanics</u> ; <u>Auto Service and Repair</u> ; Toboldt and Johnson: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics, Unit 231-1</u> ; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-37 Removing and re-building brake cylinders	Georgia: "Overhauling Master Cylinder," (SS); "Overhauling and/or Replacing Wheel Cylinders," (SS); "Bleeding Brake System," (SS); Bergwall: "Automatic Brakes Explained," (FS)	Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Brakes</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; <u>Auto Service and Repair</u> ; Toboldt and Johnson: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Units 231-2, 231-4, 231-9; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-38 Removing and rebuilding brake calipers	Bergwall: "Automatic Brakes Explained," (FS)	Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Brakes</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; <u>Auto Service and Repair</u> ; Toboldt and Johnson: <u>Automotive Encyclopedia</u>	MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-39 Replacing brake shoes and pads	Georgia: "Cam Grinding Brake Shoe," (SS); "Replacing Brake Shoes," (SS); "Replacing Front Disc Pads," (SS); Bergwall: "Automatic Brakes Explained," (FS)	Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Brakes</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; <u>Auto Service and Repair</u> ; Toboldt and Johnson: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Units 231-6, 231-7, 231-12; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-40 Machine brake drums	Georgia: "Turning Brake Chain," (SS); Bergwall: "Automatic Brakes Explained," (FS)	Remling: <u>Brakes</u> ; Toboldt and Johnson: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 231-5; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-41 Machining brake rotors	Bergwall: "Automotive Brakes Explained," (FS)	Remling: <u>Brakes</u>	MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-42 Replacing hydraulic and/or air control valves and lines	Georgia: "Cutting and Flaring Tubing," (SS)	Crouse: <u>Automotive Fundamentals</u> ; Remling: <u>Brakes</u>	Georgia: <u>Auto Mechanics</u> , Unit 102-4; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-43 Replacing power brake units	Bergwall: "Automotive Brakes Explained," (FS); GM (Olds): "Power Brakes," (FS)	Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Brakes</u>	Georgia: <u>Auto Mechanics</u> , Unit 231-13; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-44 Diagnosing brake system problems	Georgia: "Checking Brake System Condition and Operation," (SS); Ford: "Drum and Disc Brakes," (SS); Bergwall: "Automotive Brakes Explained," (FS)	Crouse: <u>Automotive Fundamentals</u> ; Remling: <u>Brakes</u>	Georgia: <u>Auto Mechanics</u> , Unit 231-1; Ford: <u>Diagnosis of Hydraulic Brakes</u> , Student Text; <u>Drum and Disc Brakes</u> , Student Text; MAVCC: <u>Braking Systems</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-45 Locating and identifying suspension system components	Bergwall: "The Front End Explained," (FS); Prentice-Hall: "How the Automobile Works," (FS); Ford: "Front and Rear Suspension Systems," (SS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Remling: <u>Steering and Suspension</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-46 Inspecting suspension system components	Georgia: "Inspecting Steering Linkage and Suspension," (SS); Bergwall: "The Front End Explained," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Unit 232-1; Oklahoma: <u>Auto Mechanics I</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-47 Lubricating and adjusting front wheel bearings	Bergwall: "The Front End Explained," (FS); Prentice-Hall: "Steering and Suspension Systems," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Unit 232-9; Oklahoma: <u>Auto Mechanics I</u>
HD-48 Replacing shock absorbers	Bergwall: "Front End Explained," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-49 Replacing front coil springs and rear leaf springs	Georgia: "Replacing Upper Control Arm Mounted Coil Springs," (SS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Units 232-12, 232-13
HD-50 Changing and balancing wheels and tires	Georgia: "Balancing Front Wheels," (SS); "Balancing Rear Wheels," (SS); "Truing Tires," (SS); Ford: "Tire Problem Analysis," (FS); Prentice-Hall: "Basic Automotive Service," (FS); "Wheel Balancing," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Units 232-7, 232-8, 232-10; Oklahoma: <u>Auto Mechanics I</u>

CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-51 Replacing upper and lower control arms and bushings	Georgia: "Replacing Ball Joints and Control Arm Brushups," (SS); Bergwall: "The Front End Explained," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Unit 232-15; Oklahoma: <u>Auto Mechanics I</u>
HD-52 Replacing upper and lower ball joints	Georgia: "Replacing Ball Joints and Control Arm Breakups," (SS); Bergwall: "The Front End Explained," (FS); Prentice-Hall: "Steering and Suspension Systems," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Unit 232-15; Oklahoma: <u>Auto Mechanics I</u>
HD-53 Replacing king pins and bushings		Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u>	
HD-54 Replacing torsion bars	Georgia: "Replacing and Adjusting Torsion Bars, Replacing Shocks," (FS); Prentice-Hall: "Steering and Suspension Systems," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Unit 232-11

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-55 Replacing twin I-beams	Ford: "Twin I-Beam Front Suspension," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u>	Ford: <u>Twin I-Beam Front Suspension, Student Text</u>
HD-56 Diagnosing suspension system problems	Georgia: "Troubleshooting Suspension and Handling Problems," (FS)	Bacon: <u>Principles of Wheel Alignment Service</u> ; Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>Automotive Mechanics</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics, Unit 282-6</u>
HD-57 Identifying steering system components	Bergwall: "The Front End Explained," (FS)	Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>The Auto Book</u> ; Dwiggin: <u>Automotive Steering Systems</u> ; Remling: <u>Steering and Suspension</u>	Oklahoma: <u>Auto Mechanics I</u>
HD-58 Adjusting manual steering gear	Georgia: "Adjusting Steering Gear," (SS)	Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>The Auto Book</u> ; Dwiggin: <u>Automotive Steering Systems</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics, Unit 233-1</u> ; Oklahoma: <u>Auto Mechanics I</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-59 Inspecting, lubricating and replacing steering gear linkage	Georgia: "Replacing Steering Linkage," (SS); Bergwall: "Lubrication Services," (FS)	Billiet: <u>Automotive Suspension, Steering, Alignment and Brakes</u> ; Crouse: <u>The Auto Book</u> ; Dwiggins: <u>Automotive Steering Systems</u> ; Remling: <u>Steering and Suspension</u>	Oklahoma: <u>Auto Mechanics I</u> ; Georgia: <u>Auto Mechanics</u> , Unit 232-14
HD-60 Replacing power steering unit	Ford: "Car Power Steering," (TR); Georgia: "Overhauling a Saginaw Rotary Valve Power Steering Gear," (SS)	Dwiggins: <u>Automotive Steering Systems</u> ; Remling: <u>Steering and Suspension</u>	Oklahoma: <u>Auto Mechanics I</u> ; Georgia: <u>Auto Mechanics</u> , Units 283-1, 283-2, 283-3, 283-4, 283-5, 283-6
HD-61 Replacing steering column	Georgia: "Reconditioning Energy Absorbing Steering Columns," (SS)	Crouse: <u>The Auto Book</u> ; Dwiggins: <u>Automotive Steering Systems</u> ; Remling: <u>Steering and Suspension</u>	Oklahoma: <u>Auto Mechanics I</u> ; Georgia: <u>Auto Mechanics</u> , Unit 233-4
HD-62 Aligning the front-end	Bergwall: "The Front End Explained," (FS); "Light Beam Alignment," (FS); Georgia: "Setting Coaster," (FS); "Setting Camber," (FS); "Setting Toe-in and Straight Ahead," (FS); "Inspecting and Aligning Front End," (FS)	Crouse: <u>The Auto Book</u> ; Dwiggins: <u>Automotive Steering Systems</u> ; Remling: <u>Steering and Suspension</u>	Georgia: <u>Auto Mechanics</u> , Units 232-4, 232-5, 232-6; Oklahoma: <u>Auto Mechanics I</u>
HD-63 Diagnosing steering system problems	Georgia: "Troubleshooting Suspension and Handling Problems," (FS); Bergwall: "The Front End Explained," (FS)	Crouse: <u>The Auto Book</u> ; Dwiggins: <u>Automotive Steering Systems</u> ; Remling: <u>Steering and Suspension</u>	Oklahoma: <u>Auto Mechanics I</u> ; Georgia: <u>Auto Mechanics</u> , Unit 282-6

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
HD-64 Identifying emissions control components	Prentice-Hall: "Servicing Ford and General Motors Emission Control Systems," (FS); Ford: "Emission Control Systems," (SS); Bergwall: "Automotive Pollution Control," (FS)	Crouse: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Unit 262-11</u> ; MAVCC: <u>Automotive Emission Control</u> ; Ford: <u>Emission Control Systems, Student Text</u>
HD-65 Removing and replacing exhaust pipes, mufflers and tail pipes	Georgia: "Servicing Exhaust System," (SS); Bergwall: "The Internal Combustion Engine," (FS)	Crouse: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Remling: <u>Basics</u>	Georgia: <u>Auto Mechanics, Unit 213-9</u> ; Oklahoma: <u>Auto Mechanics I</u>
HD-66 Diagnosing emissions control and exhaust system problems	Georgia: "Performing Tests and Servicing Emissions Controls," (SS/FS); Bergwall: "Automotive Pollution Control," (FS); "Infrared Exhaust Analyzer," (FS); Prentice-Hall: "Servicing Ford and General Motors Emission Control Systems," (FS)	Crouse: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 223-13</u> ; MAVCC: <u>Automotive Emission Control</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
AC-01 Replacing wiring and making splices	Georgia: "Replacing Wire Ends and Splicing Conductors," (SS)	Crouse: <u>Automotive Electrical Equipment</u> ; Remling: <u>Basics</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 201-2; Ford: <u>Electrical Systems</u> , Student Text; Oklahoma: <u>Auto Mechanics II</u>
AC-02 Testing and maintaining electrical protection devices	Georgia: "Troubleshooting Lighting Systems and Setting Head Lamps," (SS)	Crouse: <u>Automotive Electrical Equipment</u> ; Remling: <u>Basics</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-4
AC-03 Testing and repairing the courtesy light	Georgia: "Troubleshooting Lighting Systems and Setting Head Lamps," (SS); "Testing Electrical Wiring Condition," (FS); Ford: "Electrical Systems....," (SS)		Georgia: <u>Auto Mechanics</u> , Units 201-1, 243-4; Oklahoma: <u>Auto Mechanics II</u>
AC-04 Testing and repairing the parking light and marker lamp circuits	Georgia: "Troubleshooting Lighting Systems and Setting Head Lamps," (SS)	Crouse: <u>Automotive Electrical Equipment</u> ; Remling: <u>Basics</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-4; Oklahoma: <u>Auto Mechanics II</u>
AC-05 Testing and repairing the back-up light circuit	Georgia: "Troubleshooting Lighting Systems and Setting Head Lamps," (SS)	Crouse: <u>Automotive Electrical Equipment</u> ; Remling: <u>Basics</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-4; Oklahoma: <u>Auto Mechanics II</u>
AC-06 Testing and repairing the headlight circuit	Georgia: "Troubleshooting Electrical Systems and Setting Head Lamps," (SS); Prentice-Hall: "Basic Automotive Service," (FS)	Crouse: <u>Automotive Electrical Equipment</u> ; Remling: <u>Basics</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-4; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
AC-07 Testing and repairing the turn signal circuit	Georgia: "Troubleshooting Lighting Systems and Setting Head Lamps," (SS); Prentice-Hall: "Basic Automotive Service," (FS)	Crouse: <u>Automotive Electrical Equipment</u> ; Remling: <u>Basics</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-4; Oklahoma: <u>Auto Mechanics II</u>
AC-08 Testing and repairing the brake light circuit	Georgia: "Troubleshooting Electrical Systems and Setting Head Lamps," (SS)	Crouse: <u>Automotive Electrical Equipment</u> ; Remling: <u>Basics</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-4; Oklahoma: <u>Auto Mechanics II</u>
AC-09 Testing and repairing the horn circuit	Georgia: "Troubleshooting Lighting Systems and Setting Head Lamps," (SS)	Crouse: <u>Automotive Electrical Equipment</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-4; Oklahoma: <u>Auto Mechanics II</u>
AC-10 Testing and repairing the windshield wiper circuit (air or electric)	Georgia: "Repairing or Replacing Windshield Motor or Control," (SS)	Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-2; Oklahoma: <u>Auto Mechanics II</u>
AC-11 Testing and repairing the windshield washer circuit	Georgia: "Repairing or Replacing Windshield Wiper Motor or Control," (SS)	Crouse: <u>Automotive Electrical Equipment</u> ; Toboldt: <u>Automotive Encyclopedia</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-2; Oklahoma: <u>Auto Mechanics II</u>
AC-12 Testing and replacing instrument gauge and sending unit		Crouse: <u>Automotive Electrical Equipment</u>	Oklahoma: <u>Auto Mechanics II</u>
AC-13 Testing and repairing the CB radio power circuit		Crouse: <u>Automotive Electrical Equipment</u> ; Schultz: <u>How to Repair CB Radios</u>	

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
AC-14 Testing and trimming the CB radio antenna		Schultz: <u>How to Repair CB Radios</u>	
AC-15 Testing and repairing fog lights		Crouse: <u>Automotive Electrical Equipment</u>	
AC-16 Testing system air conditioning performance	Georgia: "Performance Testing Air Conditioning Systems," (SS); "Testing Performance of Air Conditioning," (SS); Ford: "Air Conditioning-How It Works," (FS); "Air Conditioning Principles," (TR)	Dwiggins: <u>Automotive Air Conditioning</u>	Georgia: <u>Auto Mechanics</u> , Units 243-8, 263-1; Ford: <u>Air Conditioning-How It Works</u> ; Oklahoma: <u>Auto Mechanics II</u>
AC-17 Discharging the system	Georgia: "Testing Performance of Air Conditioner," (SS); Ford: "Air Conditioning Systems," (SS)	Dwiggins: <u>Automotive Air Conditioning</u>	Georgia: <u>Auto Mechanics</u> , Unit 263-1; Ford: <u>Air Conditioning Systems</u> ; Oklahoma: <u>Auto Mechanics II</u>
AC-18 Evacuating and charging the system	Georgia: "Evacuating and Charging Air Conditioning System," (SS); Prentice-Hall, "Automobile Air Conditioners," (FS)	Dwiggins: <u>Automotive Air Conditioning</u>	Georgia: <u>Auto Mechanics</u> , Unit 243-10; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
AC-19 Rebuilding compressors	Georgia: "Replacing Compressor Seal and Checking Compressor Oil," (SS); "Overhauling a York or Tecumseh Compressor," (SS); "Testing and Overhauling a Six Cylinder General Motors Type Air Conditioner Compressor," (SS); Prentice-Hall: "Automobile Air Conditioners," (FS)	Dwiggins: <u>Automotive Air Conditioning</u>	Georgia: <u>Auto Mechanics</u> , Units 243-11, 263-3, 263-4; Oklahoma: <u>Auto Mechanics II</u>
AC-20 Replacing refrigerant lines and accessories	Georgia: "Replacing Refrigerant Hose, Dryer or Filters," (SS); "Testing and/or Replacing a POA or Expansion Valve," (SS)	Dwiggins: <u>Automotive Air Conditioning</u>	Georgia: <u>Auto Mechanics</u> , Units 243-12, 263-5, 263-6
AC-21 Installing air conditioning units	Georgia: "Installing Add-on Air Conditioner," (SS)		
AC-22 Diagnosing air conditioning problems	Prentice-Hall, "Automobile Air Conditioners," (FS)	Dwiggins: <u>Automotive Air Conditioning</u>	Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
PT-01 Adjusting and repairing clutch and shift linkage	Georgia: "Replacing Clutch," (SS); Bergwall: "The Automotive Clutch Assembly Explained," (FS); Ford: "Car and Truck Clutches," (TR)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u>	Georgia: <u>Auto Mechanics</u> , Unit 241-3
PT-02 Removing and disassembling transmission	Georgia: "Overhauling a 3-speed Transmission," (SS); Bergwall: "The Automotive Standard Transmission Explained," (FS); Ford: "Manual Shift 3-speed Overdrive Transmissions," (TR); "Manual Shift 3- and 4-speed Transmissions," (TR); Georgia: "Overhauling Synchromesh 4-speed Transmission," (SS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u>	
PT-03 Inspecting and reassembling transmission	Georgia: "Overhauling a 3-speed Transmission," (SS); Bergwall: "The Automotive Standard Transmission Explained," (FS); Prentice-Hall: "Servicing the Standard Transmission," (FS); Georgia: "Overhauling Synchromesh 4-speed Transmission," (SS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u>	Georgia: <u>Auto Mechanics</u> , Units 241-2, 241-4; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
PT-04 Removing and replacing clutch assembly	Georgia: "Replacing Clutch," (SS); Bergwall: "The Automotive Clutch Assembly Explained," (FS); Prentice-Hall: "Servicing the Standard Clutch," (FS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u>	Georgia: <u>Auto Mechanics, Unit 241-3</u> ; Oklahoma: <u>Auto Mechanics II</u> ; Ford: <u>Diagnosis of Clutch, Student Text</u>
PT-05 Removing and replacing the flywheel ring gear			
PT-06 Diagnosing manual transmission problems	Georgia: "Overhauling a 3-speed Transmission," (SS); "Replacing Clutch," (SS); "Overhauling Synchromesh 4-speed Transmission," (SS); Bergwall: "The Automotive Standard Transmission Explained," (FS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u>	Georgia: <u>Auto Mechanics, Units 241-2, 241-3, 241-4</u> ; Ford: <u>Diagnosis of Manual Transmissions, Student Text</u>
PT-07 Inspecting the drive shaft	Georgia: "Servicing U-joints and Drive Shaft," (SS); Prentice-Hall: "Servicing the Drive Shaft and Universal Joints," (FS); Bergwall: "Drive Shaft and Universal Joints Explained," (FS); Cummins: "Drive Lines," (SS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u> ; Toboldt: <u>Automotive Mechanics</u>	Georgia: <u>Auto Mechanics, Unit 241-1</u> ; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
PT-08 Removing and replacing universal joints	Georgia: "Servicing U-joints and Drive Shaft," (SS); Prentice-Hall: "Servicing the Drive Shaft and Universal Joints," (FS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics;</u> Toboldt: <u>Automotive Mechanics</u>	Georgia: <u>Auto Mechanics, Unit 241-1; Oklahoma: Auto Mechanics II</u>
PT-09 Removing and repairing constant velocity joints		Crouse: <u>Automotive Transmissions and Power Trains;</u> Toboldt: <u>Automotive Technology</u>	Oklahoma: <u>Auto Mechanics II</u>
PT-10 Removing and replacing rear axle bearings	Georgia: "Replacing and Adjusting Taper-type Rear Axle Bearings," (SS)	Crouse: <u>Automotive Transmissions and Power Trains</u>	Georgia: <u>Auto Mechanics, Unit 241-7; Oklahoma: Auto Mechanics II</u>
PT-11 Removing and disassembling differential assembly	Georgia: "Overhauling Removal Carrier-type Differential," (SS); "Overhauling Integral Carrier-type Rear Axle," (FS); Bergwall: "The Automotive Differential Explained," (FS); Ford: "Rear Axle and Drive Shaft," (FS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u>	Georgia: <u>Auto Mechanics, Unit 241-5; Oklahoma: Auto Mechanics II; Ford: Rear Axle and Drive Shaft, Student Text</u>
PT-12 Inspecting and reassembling differential assembly	Georgia: "Overhauling Removal-type Differential," (FS); "Overhauling Integral-type Rear Axle," (FS); Bergwall: "The Automotive Differential Explained," (FS); "The Limited Slip Differential Explained," (FS); Ford: "Rear Axle Diagnosis and Repair," (FS)	Crouse: <u>Automotive Transmissions and Power Trains; Automotive Mechanics</u>	Georgia: <u>Auto Mechanics, Units 241-5; Oklahoma: Auto Mechanics II; Ford: Rear Axle Diagnosis and Repairs, Student Text</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
PT-13 Removing and replacing front drive axle assembly		Crouse: <u>Automotive Transmissions and Power Trains</u>	
PT-14 Rebuilding four-wheel drive locking hubs			
PT-15 Rebuilding the four-wheel drive transfer case			
PT-16 Diagnosing drive line and rear end problems	Georgia: "Servicing U-joints and Drive Shaft," (SS); "Replacing and Adjusting Taper-type Rear Axle Bearings," (SS); Bergwall: "The Automotive Differential Explained," (FS); "Drive Shaft and Universal Joints Explained," (FS)	Crouse: <u>Automotive Transmissions and Power Trains</u> ; <u>Automotive Mechanics</u>	Georgia: <u>Auto Mechanics</u> , Unit 241-1; Oklahoma: <u>Auto Mechanics II</u>
PT-17 Testing the automatic transmission	Delmar: "Hydraulic Control," (FS); Ford: "Transmission Models C-3, C-4, C-6, JATCO, FMS and Auto Overdrive," (TR)	Crouse: <u>Automotive Transmissions and Power Trains</u> ; <u>Automotive Mechanics</u>	Oklahoma: <u>Auto Mechanics II</u>
PT-18 Inspecting and adjusting shift linkage	Georgia: "Adjusting Linkage and Replacing or Adjusting Modulator," (SS)	Crouse: <u>Automotive Transmissions and Power Trains</u> ; <u>Automotive Mechanics</u>	Georgia, <u>Auto Mechanics</u> , Unit 242-2; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
PT-19 Removing and replacing automatic transmission oil filter	Prentice-Hall: "Automotive Transmission Maintenance," (FS); Georgia: "Change Transmission Pump Screen," (SS)	Crouse: <u>Automotive Transmissions and Power Trains</u>	Georgia: <u>Auto Mechanics</u> , Unit 242-3; Oklahoma: <u>Auto Mechanics II</u>
PT-20 Testing and adjusting the automatic transmission vacuum modulator	Georgia: "Adjusting Linkage and Replacing or Adjusting Modulator," (SS)	Crouse: <u>Automotive Transmissions and Power Trains</u>	Georgia: <u>Auto Mechanics</u> , Unit 242-2; Oklahoma: <u>Auto Mechanics II</u>
PT-21 Removing and disassembling transmission	Bergwall: "The Automatic Transmission Explained," (FS); Prentice-Hall: "Servicing the Automatic Transmission," (FS)	Crouse: <u>Automotive Transmissions and Power Trains</u> ; <u>Automotive Mechanics</u>	Oklahoma: <u>Auto Mechanics II</u>
PT-22 Inspecting and reassembling transmission	Georgia: "Testing and Overhauling a C-6 Ford Transmission," (FS); Prentice-Hall: "Servicing the Automatic Transmission," (FS)	Crouse: <u>Automotive Transmissions and Power Trains</u> ; <u>Automotive Mechanics</u>	Georgia: <u>Auto Mechanics</u> , Units 271-1, 271-2, 271-3, 271-4, 271-5; Oklahoma: <u>Auto Mechanics II</u>
PT-23 Testing transmission on bench	Prentice-Hall: "Servicing the Automatic Transmission," (FS)	Crouse: <u>Automotive Transmissions and Power Trains</u> ; <u>Automotive Mechanics</u>	Oklahoma: <u>Auto Mechanics II</u>
PT-24 Removing and replacing torque converter		Crouse: <u>Automotive Transmissions and Power Trains</u> ; <u>Automotive Mechanics</u>	Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
PT-25 Diagnosing automatic transmission problems	Prentice-Hall: "Automatic Transmission Maintenance," (FS); Ford: "Automatic Transmission Diagnosis," (FS)	Crouse: <u>Automotive Transmissions and Power Trains;</u> <u>Automotive Mechanics</u>	Georgia: <u>Auto Mechanics,</u> Unit 242-1; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
IC-01 Determining engine condition	Bergwall: "Problems of the Internal Combustion Engine Explained," (FS); "Internal Combustion Engine," (FS); "Ignition System," (FS); "How to do a Major Engine Tune-Up," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Units 223-12, 223-13; Oklahoma: <u>Auto Mechanics I, II</u>
IC-02 Identifying cylinder head component parts	Bergwall: "The Internal Combustion Engine Explained," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u>	Oklahoma: <u>Auto Mechanics I</u>
IC-03 Adjusting the valves	Bergwall: "Internal Combustion Engine," (FS); Georgia: "Adjusting Valves," (SS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 211-17; Oklahoma: <u>Auto Mechanics II</u>
IC-04 Removing the cylinder head(s)	Prentice-Hall: "Automotive Engine Overhaul," (FS); Bergwall: "Internal Combustion Engine," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; <u>Auto Service and Repair</u>	MAVCC: <u>Diesel Engine Mechanics</u> , C-I; Oklahoma: <u>Auto Mechanics II</u>
IC-05 Removing and inspecting the valves	Bergwall: "Internal Combustion Engine," (FS); Prentice-Hall: "Cylinder Head Service," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u>	MAVCC: <u>Diesel Engine Mechanics</u> ; Oklahoma: <u>Auto Mechanics II</u>
IC-06 Refacing the valves and valve stems	Bergwall: "How to Use a Valve and Valve Seat Refacer," (FS); Georgia "Grinding Valves and Chamfering Stems," (SS); Prentice-Hall: "Cylinder Head Service," (FS); Sioux: "Reconditioning the Cylinder Head," (MF)	Crouse: <u>Automotive Mechanics</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	Georgia: <u>Auto Mechanics</u> , Unit 211-6; MAVCC: <u>Diesel Engine Mechanics</u> , C-1; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
IC-07 Inspecting the cylinder head	Bergwall: "How to Overhaul an Engine," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	MAVCC: <u>Diesel Engine Mechanics, C-I</u> ; Oklahoma: <u>Auto Mechanics II</u>
IC-08 Grinding the valve seats	Bergwall: "How to Use a Valve and Valve Seat Refacer," (FS); Georgia: "Reconditioning Valve Guides and Grinding Valve Seats," (SS); Prentice-Hall: "Cylinder Head Service," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	MAVCC: <u>Diesel Engine Mechanics, C-I</u> ; Georgia: <u>Auto Mechanics, Unit 211-7</u> ; Oklahoma: <u>Auto Mechanics II</u>
IC-09 Servicing the rocker arm, push rod and lifter assemblies		Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	
IC-10 Reassembling and replacing the cylinder head(s)	Georgia: "Assembling Cylinder Head and Valves," (SS); Prentice-Hall: "Cylinder Head Service," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Unit 211-8, 211-15</u> ; Oklahoma: <u>Auto Mechanics II</u>
IC-11 Diagnosing problems in the valve train	Bergwall: "The Internal Combustion Engine Explained," (FS); Cummins: "Head and Valve Train Failure Analysis," (SS); Georgia: "Troubleshooting and Diagnosing Engine Problems," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Unit 211-20</u> ; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
IC-12 Removing component parts		Dagel: <u>Diesel Engine Repair</u> ; Glenn: <u>Auto Mechanics</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-13 Removing vibration damper	Cummins: "Vibration Failure Analysis," (SS)	Dagel: <u>Diesel Engine Repair</u> ; Glenn: <u>Auto Mechanics</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-14 Removing front cover		Dagel: <u>Diesel Engine Repair</u> ; Glenn: <u>Auto Mechanics</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-15 Removing and replacing timing chain and gears	Georgia: "Installing Crankshaft and Timing Gear," (SS)	Dagel: <u>Diesel Engine Repair</u> ; Glenn: <u>Auto Mechanics</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-16 Replacing front cover and seal		Dagel: <u>Diesel Engine Repair</u> ; Glenn: <u>Auto Mechanics</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-17 Diagnosing timing chain problems		Dagel: <u>Diesel Engine Repair</u> ; Glenn: <u>Auto Mechanics</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-18 Removing engine from vehicle	Georgia: "Removing Engine," (SS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Unit 211-3</u> ; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
IC-19 Removing and inspecting usable parts	Bergwall: "The Internal Combustion Engine Explained," (FS); Cummins: "Basic Skills - Disassembly and Assembly," (SS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-20 Assembling new and used parts on block assembly	Cummins: "V-903 Engine Disassembly/Assembly," (SS); Georgia: "Installing Oil Pump, Manifold, Housing Covers and Accessories," (SS); Prentice-Hall: "Automobile Engine Overhaul," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Unit 211-18</u> ; Oklahoma: <u>Auto Mechanics II</u>
IC-21 Installing engine assembly	Georgia: "Installing Engine," (SS)	Dagel: <u>Diesel Engine Repair</u>	Georgia: <u>Auto Mechanics, Unit 211-19</u> ; Oklahoma: <u>Auto Mechanics II</u>
IC-22 Testing engine assembly	Bergwall: "How to Overhaul an Engine," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>
IC-23 Diagnosing internal engine problems	Bergwall: "Problems of the Internal Combustion Engine Explained," (FS); Cummins: "Lube Oil System - Introduction to Troubleshooting," (SS); "Oil Consumption Analysis," (SS); Georgia: "Troubleshooting and Diagnosing Engine Problems," (FS)	Crouse and Anglin: <u>The Auto Book</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Unit 211-20</u> ; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
IC-24 Disassembling an internal combustion engine	Bergwall: "The Internal Combustion Engine Explained," (FS); Georgia: "Disassembling Engine (V-8 or 6-cylinder)," (SS); "Disassembling, Cleaning and Inspecting Engine," (FS); Prentice-Hall: "The Basic Engine," (FS); "Automobile Engine Overhaul," (FS)	Crouse and Anglin: <u>The Auto Book</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Units 211-1, 251-1; Oklahoma: <u>Auto Mechanics II</u>
IC-25 Cleaning and inspecting block and components	Cummins: "Single Connecting Rod Bearing Failure," (SS); Ford: "Gasoline Engines-Repair Techniques," (FS); Georgia: "Cleaning Engine and Engine Compartment," (SS); "Removing and Measuring Crankshaft and Camshaft," (FS/SS); Prentice-Hall: "Automobile Engine Overhaul," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Ford: <u>Gasoline Engine-Repair Techniques</u> ; Georgia: <u>Auto Mechanics</u> , Units 211-4, 211-10; Oklahoma: <u>Auto Mechanics II</u>
IC-26 Preparing cylinder block	Georgia: "Servicing Cylinder Block," (FS); Georgia: Prentice-Hall: "Automobile Engine Overhaul," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 211-11; Oklahoma: <u>Auto Mechanics II</u>
IC-27 Installing cam bearings	Prentice-Hall: "Automobile Engine Overhaul," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
IC-28 Installing piston pins and rings	Ford: "Gasoline Engines - Piston Ring Service," (FS); Georgia: "Removing and Servicing Pistons and Rods," (SS); "Measuring Cylinder Diameter and Crank Pins," (SS); Prentice-Hall: "Automobile Engine Overhaul," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Ford: <u>Gasoline Engines - Piston Ring Service</u> ; Georgia: <u>Auto Mechanics</u> , Units 211-9, 251-3; Oklahoma: <u>Auto Mechanics II</u>
IC-29 Installing the crankshaft	Cummins: "Analysis and Prevention of Bearing Failure," (SS); Georgia: "Installing Crankshaft and Rear Oil Seal," (SS); "Installing Crankshaft and Timing Glass," (SS); Prentice-Hall: "Automobile Engine Overhaul," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Units 211-12, 211-13; Oklahoma: <u>Auto Mechanics II</u>
IC-30 Installing liners, pistons and rod bearings	Cummins: "Pistons and Liners Failure Analysis," (SS); "Bearing Failure Analysis," (SS); Georgia: "Installing Pistons and Rod Assemblies," (SS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 211-14; Oklahoma: <u>Auto Mechanics II</u>
IC-31 Installing oil pump, oil pan and component parts	Georgia: "Assembling Engine (V-8 or 6-cylinder)," (SS); "Installing Oil Pump, Pan, Manifold, Housing Covers and Accessories," (SS); Prentice-Hall: "Automobile Engine Overhaul," (FS)	Crouse: <u>Automotive Mechanics</u> ; Dagel: <u>Diesel Engine Repair</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Units 211-2, 211-18; Oklahoma: <u>Auto Mechanics II</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
GS-01 Adjusting fuel/air mixtures and mechanical linkage	Bergwall: "The Operation of the Fuel System Explained," (FS); Ford: "Fuel and Carburetion," (FS/T)	Crouse and Anglin: <u>Automotive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	Oklahoma: <u>Auto Mechanics I</u> ; Ford: <u>Fuel and Carburetion, Student Text</u>
GS-02 Cleaning or replacing fuel and air filters	Bergwall: "The Operation of the Fuel System Explained," (FS); Georgia: "Servicing Carburetor Air Cleaner," (SS/T)	Crouse and Anglin: <u>Automotive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Mechanic Fundamentals</u> ; Kates: <u>Diesel and High Compression Gas Engines</u> ; Dagel: <u>Diesel Engine Repair</u>	Oklahoma: <u>Auto Mechanics I</u> ; Georgia: <u>Auto Mechanics, Unit 213-10</u> ; MAVCC: <u>Diesel Engine Mechanics, D-3, E-1</u>
GS-03 Removing carburetor from engine	Ford: "Carburetor Two and Four Venturi," (TR)	Crouse and Anglin: <u>Automotive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Mechanic Fundamentals</u>	Oklahoma: <u>Auto Mechanics I</u>
GS-04 Disassembling, cleaning and inspecting carburetor	Georgia: "Overhauling a Single Barrel Rochester Carburetor," (SS); Bergwall: "The Operation of the Fuel System Explained," (FS); Ford: "Carburetor Service," (SS); Prentice-Hall: "Fuel Service," (FS)	Crouse and Anglin: <u>Automotive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Units 213-3, 4, 5, 6, 7</u> ; Oklahoma: <u>Auto Mechanics I</u>
GS-05 Reassembling and testing carburetor	Bergwall: "How to Overhaul a Carburetor," (FS)	Crouse and Anglin: <u>Automotive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Units 213-3, 4, 5, 6, 7</u> ; Oklahoma: <u>Auto Mechanics I</u>

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CURRICULUM AREA: DIESEL MECHANICS

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TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
GS-06 Testing and re-replacing fuel pumps	Georgia: "Testing or Re-replacing Fuel Pumps," (SS); Bergwall: "The Operation of the Fuel System Explained," (FS)	Crouse and Anglin: <u>Auto-motive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 213-2; Oklahoma: <u>Auto Mechanics I</u>
GS-07 Servicing fuel tank, lines and hoses and fuel level monitoring devices	Georgia: "Auto Mechanics," (SS); Bergwall: "The Operation of the Fuel System Explained," (FS)	Crouse and Anglin: <u>Auto-motive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 213-1; Oklahoma: <u>Auto Mechanics I</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , E-I
GS-08 Diagnosing fuel system problems	Bergwall: "The Operation of the Fuel System Explained," filmstrip	Crouse and Anglin: <u>Auto-motive Fuel, Lubricating and Cooling Systems</u> ; Stockel: <u>Auto Service and Repair</u>	Oklahoma: <u>Auto Mechanics I</u> ; Ford: <u>Carburetor Diagnosis</u> , Student Text; MAVCC: <u>Diesel Engine Mechanics</u> , G-11
GS-09 Inspecting, selecting and installing spark plugs	Georgia: "Auto Mechanics," (SS); Bergwall: "The Ignition System Explained," (FS); Prentice-Hall: "Electrical Ignition Service," filmstrip	Crouse and Anglin: <u>Auto-motive Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics</u> , Unit 223-9; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-IV
GS-10 Timing the ignition	Bergwall: "The Ignition System Explained," (FS)	Crouse and Anglin: <u>Auto-motive Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u> ; Stockel: <u>Auto Mechanics Fundamentals</u>	Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-IV

CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
GS-11 Inspecting and replacing ignition circuit wiring, distributor cap and rotor	Georgia: "Auto Mechanics," (SS); Bergwall: "The Ignition System Explained," (FS)	Crouse and Anglin: <u>Automotive Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u> ; Stockel: <u>Auto Mechanics Fundamentals</u>	Georgia: <u>Auto Mechanics</u> , Unit 223-8; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-IV
GS-12 Testing, removing and replacing battery ignition components	Georgia: "Testing Ignition Coil," (SS); Ford: "Ignition Systems," (SS); "Ignition System Principles of Operation," (FS); Bergwall: "How to Do a Major Tune-Up," (FS); Prentice-Hall: "Electrical Ignition Service," (FS)	Crouse and Anglin: <u>Automotive Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 223-10; Ford: <u>Ignition Systems</u> ; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-IV
GS-13 Testing, removing and replacing electronic ignition components	Bergwall: "Electronic Ignition Explained," (FS); Ford: "Solid State Ignition Systems," (SS); Georgia: "Testing and Servicing Transistor Ignition System," (FS)	Crouse and Anglin: <u>Automotive Tune-Up</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u>	Ford: <u>Solid State Ignition Systems</u> ; Georgia: <u>Auto Mechanics</u> , Unit 262-4; Oklahoma: <u>Auto Mechanics II</u> ; MAVCC: <u>Diesel Engine Mechanics</u> , F-IV
GS-14 Using and interpreting	Georgia: "Performing On-Car Fuel System Tests and Adjustments," (SS); Bergwall: "The Ignition System Explained," (FS); Ford: "Ignition System Diagnosis and Adjustment," (TR)	Crouse and Anglin: <u>Automotive Tune-Up</u> ; Sun: <u>Ignition Analyses Handbook</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics</u> , Unit 223-12

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
GS-15 Diagnosing ignition system problems	Bergwall: "The Ignition System Explained," (FS); Prentice-Hall: "Electrical Ignition Service," (FS); "Electronic Ignition Systems," (FS)	Crouse and Anglin: <u>Automotive Tune-Up</u> ; Sun: <u>Ignition Analyses Handbook</u> ; Stockel: <u>Auto Service and Repair</u>	
GS-16 Measuring exhaust emissions	Georgia: "Testing and Servicing Emission Control System," (SS); Bergwall: "Infrared Exhaust Analyzer," (FS)	Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 262-12</u> ; MAVCC: <u>Automotive Emission Control</u>
GS-17 Testing and replacing components in the positive crankcase ventilation (PCV) system		Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Stockel: <u>Auto Service and Repair</u>	Georgia: <u>Auto Mechanics, Unit 262-14</u>
GS-18 Testing and replacing components in the fuel evaporative control system	Bergwall: "Automotive Pollution Control," (FS)	Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 262-17</u> ; MAVCC: <u>Automotive Emission Control</u>
GS-19 Testing and replacing components in the exhaust gas recirculation (EGR) system	Bergwall: "Automotive Pollution Control," (FS)	Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 262-18</u> ; Ford: <u>Exhaust Gas Recirculation Systems</u> ; MAVCC: <u>Automotive Emissions Control</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
GS-20 Testing and replacing the catalytic converter	Bergwall: "Automotive Pollution Control," (FS)	Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 262-20</u> ; MAVCC: <u>Automotive Emission Control</u>
GS-21 Testing and replacing components in the thermostatic air cleaner (TAC) system	Prentice-Hall: "Servicing Ford and General Motors Control Systems," (FS); Bergwall: "Automotive Pollution Control," (FS)	Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 262-15</u> ; MAVCC: <u>Automotive Emission Control</u>
GS-22 Testing and replacing components in the air injection reaction (AIR) system	Prentice-Hall, "Servicing Ford and General Motors Emission Control Systems," (FS); Bergwall: "Automotive Pollution Control," (FS)	Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 262-16</u> ; MAVCC: <u>Automotive Emission Control</u>
GS-23 Testing and replacing components in the spark control system	Prentice-Hall: "Servicing Ford and General Motors Emission Control Systems," (FS)	Crouse and Anglin: <u>Automotive Emission Control</u> ; Johnson: <u>Automotive Diagnosis and Tune-Up</u> ; Wetzel: <u>Automotive Diagnosis and Tune-Up</u>	Georgia: <u>Auto Mechanics, Unit 262-19</u> ; MAVCC: <u>Automotive Emission Control</u>

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
DE-01 Testing to determine engine condition	Bergwall: "The Four Cycle Diesel Engine," (FS); "The Two Cycle Turbocharged Diesel Engine," (FS); "Problems of the Internal Combustion Explained," (FS); "The Internal Combustion Engine," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Kates: <u>Diesel and High Compression Gas Engines</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Units G-I, G-II, G-III
DE-02 Performing major and minor tune-up		Dagel: <u>Diesel Engine Repair</u> ; Kates and Luck, <u>Diesel and High Compression Gas Engines</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Units G-I, G-II, G-III
DE-03 Reconditioning cylinder head	Bergwall: "Diesel Mechanics," (FS); "How to Overhaul an Engine (Piston Type)," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit C-I
DE-04 Performing an in-frame overhaul	Bergwall: "Diesel Mechanics," (FS); "How to Overhaul an Engine (Piston Type)," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Units C-I, C-III, C-V, C-VI
DE-05 Performing "bench" overhaul	Bergwall: "Diesel Mechanics," (FS); "How to Overhaul an Engine (Piston Type)," (FS)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Units C-II, C-III, C-IV, C-V

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
DE-06 Demonstrating governor principles of operation	Cummins: "Principles of Mechanical Governors," (ST)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit E-VII
DE-07 Using correct terminology (governors)	Cummins: "Principles of Mechanical Governors," (ST)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit E-VII
DE-08 Classifying governors	Cummins: "Fuel Pump Governors," (ST)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit E-VII
DE-09 Adjusting hydraulic governors		Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit E-VII
DE-10 Troubleshooting governors		Toboldt: <u>Diesel Fundamentals</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Section E

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
DE-11 Identifying diesel fuel system components		Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit E-I
DE-12 Disassembling, inspecting and re-assembling the jerk pump		Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Units E-I, E-IV
DE-13 Testing and calibrating a multiple plunger injection pump		Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Units E-I, E-III
DE-14 Testing and calibrating the distributor type fuel injection pumps		Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit E-II
DE-15 Reconditioning and calibrating fuel injectors	Prentice-Hall: "The GM Detroit Diesel Engine Fuel Injector," (FS); "Servicing the GM Detroit Diesel Fuel Injector," (FS);	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Units E-IV, E-VI

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CURRICULUM AREA: DIESEL MECHANICS

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audiovisuals	Textbooks	Student Materials
DE-16 Troubleshooting the Cummins PT fuel system	Cummins: "Checking Ignition Timing," (MF); "Troubleshooting Performance Makes a Winner," (MF); "Theory of PT Fuel System," (SS); "The Cummins PT fuel Injector," (SS); "Operation Adjustment of PT (Type G) Fuel Pump," (SS); "PT (Type B) and PT (Type C) Fuel Injectors," (SS); "Calibration of PT Fuel Injectors," (SS); "Troubleshooting PT Fuel Systems," (SS)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit E-V
DE-17 Repairing blowers, turbochargers and superchargers	Prentice-Hall: "Servicing the GM Detroit Diesel Engine," (FS); Cummins: "Diesel Race Car," (MF); "Turbocharger," (MF); "Turbocharger Failure Analysis," (SS)	Dagel: <u>Diesel Engine Repair</u> ; Toboldt: <u>Diesel Fundamentals, Service, Repair</u> ; Kates and Luck: <u>Diesel and High Compression Gas Engines</u>	MAVCC: <u>Diesel Engine Mechanics</u> , Unit D-III

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UNIT GUIDE REFERENCES

Textbooks, audiovisual producers, student manuals and evaluation materials contained in the unit guide sheets are listed here. Addresses for the publishers may be found in the "Resource Addresses" which concludes this section.

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- Toboldt, W.K., Diesel Fundamentals, Service and Repair. South Holland, IL: Goodheart-Willcox, 1980.
- Toboldt, W.K. and Johnson, L., Automotive Encyclopedia. South Holland, IL: Goodheart-Willcox, 1979.
- Weathers, T., Jr. and Hunter, C., Diesel Engines for Automobiles and Small Trucks. Reston, VA: Prentice-Hall, 1981.
- Wetzel, G.F., Automotive Diagnosis and Tune-Up (6th ed.). Bloomington, IL: McKnight Publishing Co.
- Wilton and Rogers, Shop Mathematics at Work. Morristown, NJ: Silver-Burdett Publishing Co.

AUDIOVISUALS

AAVIM	Slides
Bergwall	Filmstrips
Cummins	Films, slides, video tapes, cassette tapes
Delmar	Filmstrips
Ford	Filmstrips, slides, records, cassette tapes
Georgia	Slides, cassette tapes
Prentice-Hall Media	Filmstrips
Shell	Films
Sioux	Films

STUDENT MANUALS

- AAVIM, Ball and Roller Bearings. Athens, GA: American Association for Vocational Instructional Materials, 1966.
- AAVIM, Developing Shop Safety Skills. Athens, GA: American Association for Instructional Materials, 1979.
- Ford, Air Conditioning - How it Works, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Air Conditioning Systems, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Carburetor Diagnosis, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Charging System - Alternator, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Charging System Diagnosis, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Cooling System Principles of Operation, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Diagnosis of Clutch, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Diagnosis of Hydraulic Brakes, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Diagnosis of Manual Transmissions, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Drum and Disc Brakes, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Electrical Systems, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Exhaust Gas Recirculation Systems, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Fuel and Carburetion, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Gasoline Engines - Piston Ring Service, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Gasoline Engine Repair Techniques, Student Text. Detroit, MI: Ford Motor Company.
- Ford, Ignition Systems, Student Text. Detroit, MI: Ford Motor Company.

- Ford, Rear Axle and Drive Shaft, Student Text. Detroit, MI: Ford Motor Company.
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- Ford, Twin I-Beam Front Suspension, Student Text. Detroit, MI: Ford Motor Company.
- Georgia, Auto Mechanics Program. Athens, GA: Vocational Education Materials Center, University of Georgia, 1976.
- Georgia, Metal Fabrication Cluster. Athens, GA: Vocational Education Materials Center, University of Georgia.
- Georgia, Vocational Mathematics. Athens, GA: Vocational Education Materials Center, University of Georgia.
- MAVCC, Automotive Emission Control. Stillwater, OK: Mid-America Vocational Curriculum Consortium, 1979.
- MAVCC, Braking Systems. Stillwater, OK: Mid-America Vocational Curriculum Consortium.
- MAVCC, Diesel Engine Mechanics. Stillwater, OK: Mid-America Vocational Curriculum Consortium, 1979.
- Oklahoma, Auto Mechanics, Vols. I and II. Stillwater, OK: Oklahoma State Board of Vocational Education, 1978.

EVALUATION MATERIALS

- Georgia, Student Assessment System. Athens, GA: Vocational Education Materials Center, University of Georgia, 1980.
- Hughes, J., Guide to the Automobile Certification Exam. Tarrytown, NY: Prentice-Hall Media, 1978.
- Ohio State, Shop Safety. Columbus, OH: Ohio State University, Trade and Industrial Education.
- V'TECS, Auto Parts Catalog. Atlanta, GA: Vocational Technical Education Consortium of States.
- V'TECS, Automotive Mechanics. Atlanta, GA: Vocational Technical Education Consortium of States, 1975.
- V'TECS, Diesel Mechanics. Atlanta, GA: Vocational Technical Education Consortium of States, 1979.

ADDITIONAL INSTRUCTIONAL MATERIALS

The additional instructional materials provide supplementary resources that are not referenced in the Unit Guides section.

The following textbooks, audiovisuals and manuals are produced by industry, media companies and various military branches. Manufacturer's of diesel engines and equipment and seminars available to Diesel Instructors are also listed. Often these companies can supply various training aids, materials and shop manuals at reduced prices.

Addresses for these may be found in the "Resource Addresses" which concludes this section.

Textbooks

Black, P.O., Diesel Engine Manual. Indianapolis, IN: Bobbs-Merrill, 1964.

Brady, R.N., Diesel Engines: Fuel Injection, Governors and Tune-up. Englewood Cliffs, NJ: Prentice-Hall, 1980.

Grosser, M., Diesel the Man and the Engine. Paterson, NJ: Book Warehouse, Inc., 1978.

MacClean, D., Diesel Engine Maintenance. Indianapolis, IN: Bobbs-Merrill, 1980.

Maleer, V.L., Diesel Engine Operation and Maintenance. New York, NY: McGraw-Hill, 1954.

Nunes, J., Diesel Heavy Truck Applications and Performance Factors. Englewood Cliffs, NJ: Prentice-Hall, 1980.

Rudman, J., Diesel Engine Repair. Syosset, NY: National Learning Corp.

Schulz, E.J., Diesel Equipment I, Workbook: Lubrication Hydraulics, Brakes, Wheels, Tires. New York, NY: McGraw-Hill, 1980.

Schulz, E.J., Diesel Equipment II, Workbook: Design Electronic Controls, Frames, Suspensions, Steering, Transmissions, Drive Lines, Air Conditioning. New York, NY: McGraw-Hill, 1980.

Schultz, E.J., Diesel Mechanics. New York, NY: McGraw-Hill, 1977.

Audiovisuals*

National Audiovisual Center

"Air Brakes-Principles of Operation"	Movie Film
"Automotive-Bus Operation-A Series"	Movie Film
"Automotive-School Bus Operation-A Series"	Movie Film
"Battery, Ignition, and Electrical System"	Movie Film
"Bus Care and Maintenance"	Movie Film
"Carburetor, Principles of Operation"	Movie Film
"Care of a Tractor"	Movie Film
"Clutch and Hand Brake"	Movie Film
"Cooling System and Fuel System"	Movie Film
"Engine Assembly"	Movie Film
"Engine Tests and Tune Up"	Movie Film
"Fluid Coupling-Principles of Operation"	Movie Film
"General Motors Diesel Engine Unit"	
Injectors-Disassembly and Reassembly, Model 278	Movie Film
"General Motors Diesel Engine Unit"	
Injectors-Maintenance	Movie Film
"Hydraulic Brake System"	Movie Film
"Hydraulic Controls in the Hydramatic Transmission"	Movie Film
"Hydraulic Steering-Principles of Operation"	Movie Film
"Ignition Timing-GMC Engine"	Movie Film
"Inspecting and Adjusting Hydraulic Brakes"	Movie Film
"Introduction to Preventive Maintenance"	Movie Film
"Jobs in Automotive Trades"	Movie Film
"Keeping Your Car Fit"	Movie Film
"Know Your Car"	Movie Film
"Operation of the GM Unit Injectors"	Movie Film
"Periodic Check-Up"	Movie Film
"Steering, Wheels, Front and Rear Axles"	Movie Film
"Supercharging and Fuel Injection"	Movie Film
"Transmission, Drive Shaft and Differential"	Movie Film
"Troubleshooting Your Car"	Movie Film
"Vehicle Maintenance Story"	Movie Film
"Why Battery Should Always be Clean"	Movie Film

*Also write diesel manufacturer's for audiovisual listings

Repair Manuals*

Chilton, Chiltons Truck and Van Repair Manual. Radnor, PA:
Chilton Book Bompany, current edition.

Mitchell, Light Truck Repair. San Diego, CA: Mitchell Manuals
Inc., current edition.

Motor, Motor Truck Repair Manual. New York, NY: Motor Manuals,
current edition.

Manufacturers

Airsearch

Fairbanks-Morse

Allis-Chalmers

Ford Industrial Engines

American Bosch

Fuller Transmission Division

Bacharach Instrument Co.

GMC Truck and Coach

Budd Company

International Harvester

Caterpillar

John Deere

Cummins Engines

Kiene Diesel

Diamond Rio

Spicer Axle Division

Eaton Axle Division

White Engines, Inc.

Seminars**

Cummins Georgia, Inc.
141 Bucknell Court, S.W.
Atlanta, GA 30336

Ohio Diesel Technical Institute
1421 East 49th Street
Cleveland, OH 44103

*Also write manufacturer's for specific product manuals

**Write for information

RESOURCE ADDRESSES

AAVIM
120 Engineering Center
Athens, GA 30602

Airesearch
P.O. Box 92930
Los Angeles, CA 90009

Allis-Chalmers
Engine Division
Box 563
Harvey, IL 60426

American Bosch
3700 Main St.
Springfield, ME 01707

American Technical Society
5608 Stony Island Avenue
Chicago, IL 60637

Bacharach Instrument Co.
625 Alpha Dr.
Pittsburgh, PA 15238

Charles A. Bennett Co., Inc.
809 W. Detweiller Drive
Peoria, IL 61615

Bergwall Productions, Inc.
Garden City, NY 11530

Book Warehouse, Inc.
Vreeland Avenue
Boro of Totowa
Paterson, NJ 07512

Bobbs-Merrill Co., Inc.
4300 W. 62nd St.
Indianapolis, IN 46468

Budd Company
3155 T W. Big Beaver Rd.
Troy, MI 48084

Caterpillar
100 N.E. Adams
Peoria, IL 61629

Chilton Book Company
Chilton Way
Radnor, PA 19089

Cummins Engine Company
Box 3005
Columbus, IN 47201

Delmar Publishers
7625 Empire Drive
Florence, KY 41042

Diamond-Reo Division
Yeet Industries
25759 M 97 Highway
Warren, MI 48089

Eaton Axle Division
739-T E 140th St.
Cleveland, OH 44110

Fairbanks-Morse Engine Div.,
Colt Industries
701 Lawton Ave.
Beloit, WI 53511

Ford Industrial Engines
300 Renaissance Center
Suite 1800
P.O. Box 43338-T
Detroit, MI 48243

Ford Motor Company
The American Road
Dearborn, MI 48231

Fuller Transmission Drives
222 Mozel Ave.
Kalamazoo, MI 49007

General Motors Corporation
2860 Clark Avenue
Detroit, MI 48232

Goodheart-Willcox Company
123 W. Tart Drive
South Holland, IL 60473

GMC Truck and Coach Drive
660 S. Boulevard
Pontiac, MI 48053

Georgia Office of Vocational
Education
Georgia Department of Educa-
tion
Atlanta, GA 30334

International Harvester Co. 600 Woodfield Dept. 923 Schaumburgh, IL 60196	Prentice-Hall Media ServCode XF 150 White Plains Road Tarrytown, NY 10591
John Deere Service Publications Department F John Deere Road Moline, IL 61265	Shell Film Library 1433 Sadlier Circle, West Dr. Indianapolis, IN 46239
Kieve Diesel Accessories, Inc. 325 S. Fairbanks Street Dept. T Addison, IL 60101	Silver-Burdett Co. 250 James Street Morristown, NJ 07960
McGraw-Hill 1221 Avenue of the Americas New York, NY 10020	Sioux, Inc. 2901 Floyd Boulevard Sioux City, IA 51102
McKnight Publishing Company Bloomington, IL 61701	Spicer Axle Division P.O. Box 1209 Ft. Wayne, IN 46801
Mid-America Vocational Curriculum Consortium 1515 W. Sixth Avenue Stillwater, OK 74074	L.S. Starrett Co. Athol, MA 01331
Mitchell Manuals, Inc. P.O. Box 80427 San Diego, CA 92138	Vocational Curriculum Center Georgia Department of Education 3952 Shirley Drive Atlanta, GA 30336
Motor Manuals 1970 Broadway New York, NY	Vocational Education Materials Center Division of Vocational Education College of Education University of Georgia Green Street Athens, GA 30602
National Audiovisual Center National Archives and Records Service General Services Administration Order Section/RK Washington, DC 20409	Vocational-Technical Education Consortium of States Southern Association of Colleges and Schools 795 Peachtree Street, N.E. Atlanta, GA 30365
National Learning Corporation 212 Michael Dr. Syosset, NY 11791	White Engine, Inc. 701 11th St. S.E. Canton, OH 44707
Oklahoma State Department of Vocational-Technical Education Curriculum and Instructional Materials Center 1515 W. Sixth Avenue Stillwater, OK 74074	John Wiley and Sons, Inc. 605 3rd Avenue New York, NY 10158
Prentice-Hall, Inc. Englewood Cliffs, NJ 07632	

APPENDIX B

Special Needs

WORKING WITH SPECIAL NEEDS STUDENTS*

Introduction

Special needs population students are those who are designated as handicapped or disadvantaged. The 1976 vocational education amendments define handicapped individuals as:

Persons who are mentally retarded, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, orthopedically impaired, health impaired, or persons with other specific disabilities, who by reason thereof require special education and related services and who cannot succeed in the regular vocational education programs.

In those same amendments disadvantaged persons are defined as:

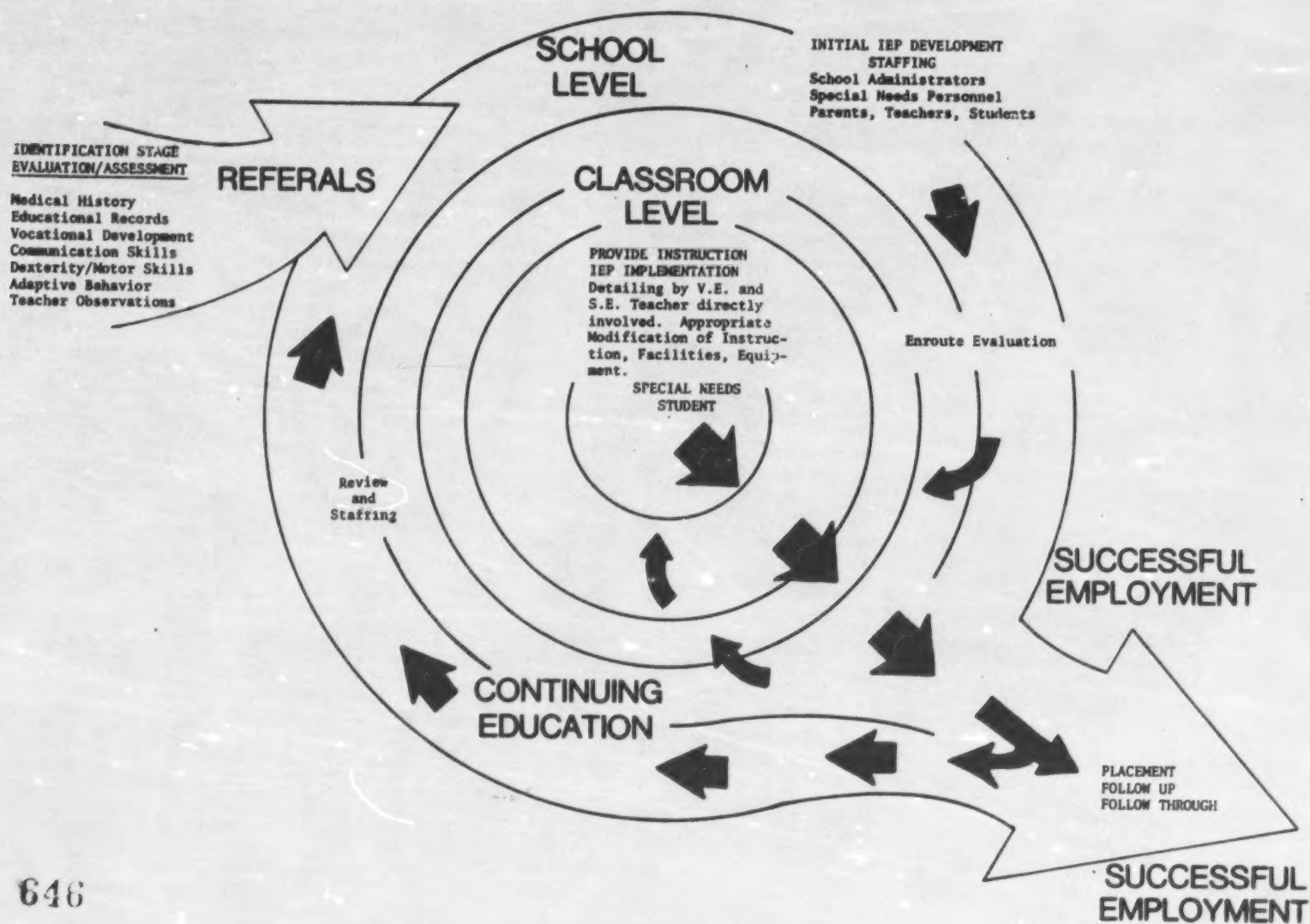
Persons (other than handicapped persons) who have academic or economic disadvantages and who require special services, assistance or programs in order to enable them to succeed in vocational education programs.

Federal legislation requires that these special needs population students be given an opportunity to function in regular vocational education programs (Essentially, this is what is meant by the term mainstreaming.). This section provides information on how such students are identified and how they can be mainstreamed into regular vocational education environments.

Figure One presents a conceptual model depicting various activities of the process in identifying and mainstreaming special needs students in vocational education. These activities

*The project director wishes to thank Mrs. Ann Lary, State Department of Education staff and Mrs. Rhonda Packer, VEMC staff, for their careful review of this section and for their suggestions that improved the overall value of this paper. Appreciation is also extended to Ray Butler for his patient work in reviewing and sorting available resources.

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are conducted at three levels: the community level, the school level (Career Development Center) and the classroom level. All three levels must work together if implementation of the process is to be effective.

Identification of the Special Needs Student

Through a variety of pre-testing procedures, special needs students are identified and their potentials are evaluated at the community level. This evaluation process consists of collecting and assessing the following data for each student:

- Medical History
- Educational Records
- Vocational Development
- Communication Skills
- Dexterity/Motor Skills
- Adaptive Behavior
- Teacher Observations

When this procedure has been completed, the community personnel refers the student to the appropriate school level personnel. As a part of the referral and school intake process, an Individualized Educational Plan should be initiated.

The Individualized Educational Plan (IEP) is exactly what its name implies--a plan for the education of a specific individual. The base content of the IEP is outlined in Public Law 94-142. According to that outline, the IEP must include at least the following information: (a) student's present level of functioning, (b) his/her long range instructional objectives, (c) his/her short-range instructional objectives and finally, (d) some criteria to determine that those objectives have been achieved.

Development of the Individual Education Plan

It would be very difficult to anticipate the exact kind or type of special needs students one might find in a Diesel Mechanics program at any one time. The terms disadvantaged and handicapped are really "catch-all" terms that indicate a wide assortment of problems that might occur in a student

representing one of these populations. In addition to the lack of a specific definition and the fact that the typical vocational instructor has had very little preparation in working with these students, it becomes clear that you will need a basic plan to use in meeting their occupational preparation needs. The following steps can serve as your basic planning procedure for mainstreaming a special needs population student into your curriculum.

The first step occurs after you have been notified that a special needs student can profit from being in your vocational program. When you have received that notification, you should contact your coordinator of student personnel services and ask for a detailed report of the student's assessed status. Note the word assessed; it is critical. Through a formal assessment status, appropriate school personnel and community should have identified the student's strengths and weaknesses as well as the specific handicapping conditions. After you have received the assessment information and understand it you are ready for Step Two.

Step Two, developing (or completing) the vocational aspects of the Individual Education Plan-IEP, is usually performed for handicapped students only; however, it has just as much merit for the disadvantaged. The IEP is a very useful tool. It should be considered the description of what you expect that student to be able to do when he or she completes your course and how you will provide the learning experiences to assure that those expected outcomes will be achieved. Be sure that you keep this IEP in a convenient place and use it.

The IEP is usually developed through group activities called staffings. Staffings may be held as often as needed and can be used to modify the IEP as the student moves through the program. When a student is about to be mainstreamed into your curriculum, you must become involved in the staffing sessions that will develop the vocational aspects of the IEP. IT IS YOUR RIGHT AND YOUR DUTY, therefore, your being present during the staffings is imperative. The special education personnel can present the student's interests, strengths and limitations. However, only you, the vocational instructor, can relate these to your program. This means that the final statement of the job (DOT) and the task level (short term) objectives are primarily defined by you the vocational instructor.

In Step Three the IEP will first be used to suggest how the curriculum and/or the facilities can be modified to accommodate the special needs population student. Modifying the curriculum means that in most cases special adjustments will have to be made in the student materials and that special instructional strategies will need to be developed. When you say modify the curriculum you are not suggesting that the content be "watered down" - you are proposing alternate ways to teach the proper/required content. REMEMBER! ALL VOCATIONAL EDUCATION PROGRAMS ARE BASED ON REAL JOBS THAT HAVE THEIR OWN TASKS AND STANDARDS. AS FAR AS YOU ARE CONCERNED, YOU HAVE NO POWER TO CHANGE THESE. YOU ALSO CANNOT SUCCESSFULLY CREATE A WHOLE NEW JOB.

Modification of facilities and equipment is a concern when working with the physically handicapped. Be reminded that by

law your school building must already meet requirements of accessibility to all handicapped persons--especially those who are blind or are confined to wheelchairs. Your chief concern is to be sure that your classroom and laboratory will allow the handicapped students to be comfortable and above all to learn. You will also need to make certain modifications that will enable handicapped students to properly and safely use the "tools and equipment of the trade". It is foolish to think that you would have a ready answer for all or any particular one of these physical handicaps--call on the experts. Vocational rehabilitation counselors and other staff have been concentrating on these problems for many years. They should be able to offer a number of positive suggestions. A combination of VR experience and instructor creativity can and has produced outstanding results.

As we think about curriculum modification it would help to review some general learning needs of this population.

The educationally mentally retarded will constitute a major population now entering vocational education. The key concept to remember in modifying the curriculum for this population is that they require much more detail in order to learn and they require a great deal more practice time. All curriculum modifications for these groups should be made by detailing each task or objective into its smallest parts and by providing for more and more practice.

The hearing and visually impaired can be accommodated by common sense and the use of supporting resource personnel. Neither of these groups reads well or learns from reading as a primary mode. This should be accounted for in modifying the curriculum, i.e., larger print, brail and recordings for the blind and captions on visual materials, seating arrangements, use of notes from a classmate, lower reading level textbooks, oral testing and total communications for the deaf.

The orthopedically handicapped usually require attention to facilities and equipment. Beyond that, their learning needs are as varied as those of the normal population. Remember, some of these individuals will actually be highly gifted in their chosen field. Their major needs will be psychological and coping with the school environment.

The disadvantaged are physically and mentally capable of learning, but their background has not allowed them to fully develop the discipline and cognitive skills (i.e., vocabulary, math, etc.) required to master occupational preparation courses. They have also developed an anti-school attitude that complicate many efforts to modify the curriculum for them. Usually their success in the vocational program is contingent on either a good pre-vocational program or a supporting academic program.

Step Four requires that instructional strategies be selected. These strategies may be many and should be varied. They should reflect the best learning technique for a given student and his or her chosen occupation. Some examples of instructional strategies are discussed below.

Teacher demonstration: Simply show the student how the job is to be done in clear distinct steps.

Peer demonstration: This technique allows the instructor to use one of the advanced students to demonstrate a particular task in a step by step fashion. It is a flexible system. For example, you can use peer demonstration to show each task step while you explain them to the students. When working with the mentally retarded, you will never have enough time to demonstrate a task as often as they may need to see it. In such situations, the well prepared advanced student can perform and explain the same demonstration several times.

Shadowing: Shadowing can be used in conjunction with demonstrations. By shadowing, the student is allowed to do exactly what the demonstrator does. This allows the student to learn in a see and do fashion. The student may shadow the instructor, an advanced peer or in some instances the worker on the job.

Job site visits: Job site visits offer the student an opportunity to see the work being done in its natural location. Students can develop a worker identify a realistic view of how the tools, equipment and materials are brought together to produce the product.

Work group or team: By being a part of a work team, the student can learn the various roles in an occupation as having the opportunity to practice specific sets of skills under the tutelage of peers.

Individualized instruction: Appropriately prepared or adjusted individualized instruction is a big help in managing a class that contains a mixture of special needs population students and "norm group" students. Individualized instruction, no matter what the source, will require much developmental input from the instructor. In most all cases, however, the results are worth the effort.

Media: Many of the special needs populations require mediated instruction (i.e., hearing and visually impaired), however, the use of appropriate media enhances learning for all students. Media can range from a line drawing in an instructional module, to a video tape, to posters and charts. It can be instructor made or commercial. All that matters is that it exactly links to the objective.

Project Method: The value in using projects with special needs population students is that they help them mentally and physically unify all the parts into a uniform whole. Because of the detail required for them to learn, they need learning activities that relate all of the parts to the whole. The development of a product through an assigned project is an ideal integrating experience.

Simulations: Simulations meet a variety of instructional needs. One of the more important with special needs population students is providing the opportunity to develop proper safety concepts before actually working with the "live" equipment that could be dangerous to a careless student.

Role playing: Role playing is a part of several other instructional strategies. On its own, it is a very good procedure for developing the attitudes and values required of a successful worker-i.e., a sense of responsibility, the ability to take orders and follow directions, interpersonal skills and so on. It is a way to concentrate on developing good work habits and positive attitudes.

Peer instruction: Like peer demonstrations, peer instruction is able to multiply the instructor's available time. This allows individual students with specific needs to have more assistance. Peer instruction has values beyond expanding time; it is an excellent approach to learning. In almost every situation, both the peer teacher and the peer student profit from the exchange. In operation peer instruction is simply a matter of preparing and allowing one of the advanced students to teach small groups certain segments of a course.

Team teaching: As we have already noted, some special needs populations require a combination of vocational and special education presented in harmony. A team approach is the only way to meet that need. For team teaching to be effective, clarification of student needs (as defined by the IEP) and careful planning will be required.

Peer apprenticeships: The peer apprenticeship is an ideal way to induct the new special needs population student into the curriculum. By serving as the apprentice to an advanced student, the special needs population student can become climatized to the laboratory/shop and can begin to learn the tools, equipment and materials of the program. The shadow technique can also be added to increase hands-on learning.

Assessment and feedback: Student learning can be improved by frequently assessing students' skills and feeding back their strengths and weaknesses. Through a process of positive feedback, the student can be moved gradually from where he or she is to the level of skill required.

These instructional strategies can be used independently or in various combinations. This brief list is meant only to provide you with some suggestions, there are no doubt many other techniques that could be used. The creative instructor will be constantly innovating to meet the needs of particular students.

Implementing the IEP

Step Five is a matter of putting the vocational aspects of the IEP into operation. The activation of the IEP initiates the student into the vocational education program and allows him or her to progress through the modified curriculum at his or her optimum rate. There should be frequent assessment activities that indicate where the student is relative to the IEP objectives. If problems are detected, a staffing should be conducted to re-evaluate the IEP and continue the process in a fashion that is most beneficial to the student.

Step Six will take the student to his or her next logical step of either totally exiting the system or recycling into a continuing education mode. In most cases, the student will do some of both--getting a job and periodically accessing the continuing education component of the educational system to refine existing skills or to broaden his or her capacity.

The ultimate goal of all this effort is not employment--rather it is "successful employment". Successful employment implies that not only is the student placed in a job, but that the student is able to sustain himself or herself in a working environment over an extended period of time.

Evaluation

Evaluation of the student's program is a critical step. Through that process we not only help the current student, but we are able to gather information that will improve our potential to help students with similar difficulties in the future. A well rounded evaluation system should consist of the following activities:

- En-route evaluation (formative) to monitor the student's progress through the program.
- Summative evaluation upon completion of the program to determine job readiness.
- Follow-up after placement to determine if the student is successful on the job.
- Follow-through activities designed to identify any further training needed, which may be indicated by the follow-up procedure.

RESOURCES

In recent years, mainstreaming of special needs population students has been an area of great concern to vocational

educators. The overall result of that concern is an abundance of well developed resource materials and a variety of personnel with special skills in working with these groups. In the space allowed by this curriculum guide, it would be impossible to present an adequate set of methods and procedures for solving the problems of students with special needs, but if the vocational education administrator and instructor will judiciously use the human and material resources listed here, much of the in-depth information required for the special and unique cases that will occur can be compiled from these sources.

Support Personnel or Systems

As was noted earlier, you the vocational instructor, simply do not have sufficient skills to work with special needs population students alone. There are too many different student problems to ever allow an instructor to deal with them all on a "come as you are" basis. For that reason, you must make yourself aware of the variety of support systems and personnel that are available to you and to the students. A few of these are listed here. These specialists can lead you to others on an as needed basis.

County Health Department - Many of your special needs population students will need some medical and dental assistance. The county health facility is an excellent referral source for these problems.

Special Education - Through local boards of education there are a variety of special education personnel available locally, regionally and from the State Department of Education. The vocational education administrator can obtain assistance from these specialists through the local superintendent's office.

Project SERVE - Project SERVE is a statewide effort to acquire materials and to cultivate expertise in providing vocational education to disadvantaged. Project Serve can

be contacted by the area vocational-technical director or the vocational supervisor.

Vocational Rehabilitation - Vocational rehabilitation is a highly developed organization whose major focus is all dimensions (such as: diagnosing, training, job placement and counseling) of the handicapped population. Within that network is a vast pool of expertise. You can contact it through the area vocational rehabilitation counselor who calls on your school or through a designated school official such as the coordinator of student personnel services or Career Development Center personnel.

Office of Student Personnel Services - In the area vocational-technical school, this is the key group as far as students and student needs are concerned. They can provide a variety of services to you and to your students. Many of the contacts with community agencies have already been made by this group-that alone will save the instructor much time.

Career Development Center - Each area vocational-technical school has a Career Development Center designed to meet the very special needs of incoming disadvantaged and handicapped students. The CDC staff is available to assist the instructional staff with a wide range of services for the special needs student populations.

All of the resources and resource personnel listed here are a part of the team. The best results can be obtained by using as many of these people and their support systems as possible from the beginning. In some situations, you will miss a resource in the beginning or the student's needs change. When that occurs do not hesitate to call on the appropriate experts for additional help. As a matter of fact, the rule of thumb that has always been used in the "helping professions" is to go as far as you can, then refer. Do not hesitate to call for help. Most of these service groups are funded to support "your" student. If you do not use them, they fail in their mission and you fail in yours.

Related Materials

Sarkees, M. and Scott, J. Trade and Industrial Education/Vocational Special Needs. Alsip, Illinois: American Technical Publishers, 1981.

Mentally Retarded

A Curriculum Guide for Teachers of Educable Mentally Retarded. Danville, Ill.: The Interstate Printers and Publishing Co., Inc.

High, Elizabeth C., and Moyers, Kathy L. Training Manual: Developing Pre-Vocational/Vocational Skills in Developmentally Disabled Persons. Washington, D.C.: Job Development Laboratory, George Washington University, 1976.

Kolstoe, Oliver P. Teaching Educable Mentally Retarded Children. Holt, Rinehart and Winston, 1976.

Mulligan, Robert E., Gavin, Donald and Conaley, James. Comprehensive Career Education Curriculum Guide for the Trainable. New Brunswick, N.J.: Rutgers Vocational-Technical Curriculum Laboratory, 1977.

Introduction to Vocations for Educable Mentally Retarded. New Jersey: New Jersey Department of Education.

State of Ohio Curriculum Guide for Moderately Retarded Learners. Columbus, Ohio: Ohio Department of Education, 1977.

Tucker, Mark M. Learning through Curriculum Modification: A Blueprint to Teaching the Mentally Retarded. Johnstown, Pa.: Mafex Associates, Inc., 1976.

Watson, Marjorie. Mainstreaming the Educable Mentally Retarded. Washington, D.C., NEA, 1975.

Hearing Impaired

Alvin, Howard P. The Evolution of an Evaluation Design for Evaluating Secondary Programs for the Deaf in Vocational Occupational-Technical Education (VOTE) Programs. ERIC ED 123-241.

Guidelines: Educational Planning for the Hearing Handicapped. North Carolina Public Schools. Division for Exceptional Children, North Carolina Department of Public Instruction, Raleigh, N.C., 1977.

Minson, Harold L., Eglston, Judy Cobb and Phillips, Gordon B. Career Education for Deaf Students: An In-Service Leader's Guide. University of Rochester, College of

Education, Center for the Study of Helping Services,
Rochester, N.Y., 1975.

Nix, Gary W. Mainstreaming Education for Hearing Impaired
Children and Youth. Grune and Stratton, 1976.

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APPENDIX C

Definition of Terms

DEFINITION OF TERMS

1. A/Vs-Audiovisuals - May refer to any picture and/or sound media. (ie. slides, tapes, filmstrips, 16 mm films, etc.)
2. Checkpoint - A student-instructor interface point wherein the instructor may give the student a test, perform a demonstration, or simply provide the student with additional needed information or instructions. Also a checkpoint may be used for motivational purposes.
3. Competency - The ability (knowledge, skills and attitudes) to perform all of a group or cluster of related tasks required to complete a designated activity according to occupational standards. In the educational setting, the statement of a competency includes expected student outcomes in terms of knowledge, skills and attitudes required to complete a designated activity as defined by incumbent workers according to the standards of the work place.
4. Course - A grouping of tasks and competencies which have a common knowledge base or are within a given domain.
5. Criterion-Referenced Measure - An exercise based upon a performance objective, the accomplishment of which measures attainment of that objective.
6. Criterion-Referenced Test - A test designed to measure student competencies based on job or industrial standards.
7. Curriculum Guide - A document containing the objectives, content, organization and structure of an instructional program. It is designed for use by administrators, instructional supervisors and teachers.
8. D.O.T. - Abbreviation for Dictionary of Occupational Titles. Document provides nine digit codes identifying each occupation.
9. Duty - One of the distinct major activities involved in the work performed. A Composition of related tasks.
10. Exit Point - A pre-determined point within an instructional program in which a student may exit with the essential competencies for a specific job. Usually defined in terms of D.O.T. codes and/or O.E. codes.
11. "Hands-On" - Statement implying the student is physically involved in a learning activity.
12. Individualized Instruction (I.I.) - A system of instruction allowing a student to progress at his/her fastest rate.

13. Job - A specific area of specialization within an occupational field consisting of several closely related duties for which a person would expect to receive remuneration. Should be identified by DOT code.
14. Job Sheet - (Or Operations Sheet) - A project of a performance nature. Generally performed by the student in a lab or shop type environment or in a specialized work area.
15. Live Work - Generally refers to items brought into the course area for repair or adjustment. Examples of live work might be automobiles, radios and TV's, air-conditioners, etc. Another form of live work would be patrons visiting the cosmetology department to receive permanents or other services.
16. Master Copies - Original copies of slides, tapes or written materials set aside for the purpose of duplication.
17. Occupational Cluster - A group of occupations sharing a common core of competencies. Georgia's comprehensive high school vocational program is organized around this concept.
18. Occupational Inventory - A listing of tasks to be performed in a particular occupational area, grouped under duty classifications.
19. O.E. - Refers to the U.S. Office of Education. O.E. codes are a classification system (taxonomy) for occupational education programs.
20. Open Entry - Term meaning that a student may enter the program at any time and does not have to wait for quarter or semester breaks.
21. Open Exit - Term meaning that a student may leave a program any time he/she completes occupational objectives.
22. Performance Guide - A series of steps arranged in a sequence which when completed may result in the performance of a task. Also called teaching steps.
23. Performance Objective - A statement in precise, measurable terms of a particular behavior to be exhibited by a learner underspecified conditions. It possesses each of the elements or characteristics specified below:
 - a. Condition - The testing situation confronting the learner is clearly specified. This includes equipment provided or withheld, environmental constraints such as temperature, space, etc.

- b. Performance - The specific behavior expected of the learner is stated.
 - c. Standard - The degree of acceptable performance is specified.
- 24. Performance Test - A test entailing not only the ability to answer questions, but measuring the student ability to operate, manipulate or perform a given task.
 - 25. Program - An organized sequence of courses leading to an occupational objective. A program may contain one or more student exit points as defined by D.O.T. codes.
 - 26. Program Objective - The outcome of a prescribed program of instruction. Usually expressed in terms of the occupation or job for which training is designed. D.O.T. codes are frequently used to identify program objectives or student exit points.
 - 27. Self-Paced - Refers to a student moving through the prescribed training program at the fastest pace at which he/she can meaningfully learn.
 - 28. Sequencing - Putting any set or series of learning activities or tasks into proper order or sequence. Normally arranged from simple to complex within groupings or blocks.
 - 29. Software - Written or printed materials, slides, filmstrips, tapes, etc.
 - 30. Student Manual - A document designed for use by students in a specific instructional program. It contains unit sheets, references, operational procedures, job sheets, etc.
 - 31. Task - The smallest division of work in which a measurable output occurs. A logical and necessary step in the performance of a duty.
 - 32. Task List - A listing of tasks performed by incumbent workers within a domain of interest. An example is a listing of all tasks performed by an automotive mechanic or by a worker in ornamental horticulture.
 - 33. Unit - One "module" training material that generally covers one learning task and programmed on one unit sheet. May cover more than one lesson.
 - 34. Unit Guide - A curriculum guide sheet that lists a task and objective with the instructional activities, instructional materials, evaluation and approximate time required for a student to successfully complete the task.

35. V'TECS Catalog - A comprehensive collection of performance objectives, performance guides, criterion-referenced measures and related data. Organized by a job structure or career ladder within a domain of interest.

Federal law prohibits discrimination on the basis of race, color or national origin (Title VI of the Civil Rights Act of 1964); sex (Title IX of the Educational Amendments of 1972 and Title II of the Vocational Education Amendments of 1976); or handicap (Section 504 of the Rehabilitation Act of 1973) in educational programs or activities receiving federal financial assistance.

Employees, students and the general public are hereby notified that the Georgia Department of Education does not discriminate in any educational programs or activities or in employment policies.

The following individuals have been designated as the employees responsible for coordinating the department's effort to implement this nondiscriminatory policy.

Title II - Loydia Webber, Vocational Equity Coordinator

*Title VI - Peyton Williams Jr., Associate Superintendent
of State Schools and Special Services*

Title IX - Evelyn Rowe and Myra Tolbert, Coordinators

Section 504 - Jane Lee, Coordinator of Special Education

Inquiries concerning the application of Title II, Title VI, Title IX or Section 504 to the policies and practices of the department may be addressed to the persons listed above at the Georgia Department of Education, State Office Building, Atlanta 30334; to the Regional Office for Civil Rights, Atlanta 30323; or to the Director, Office for Civil Rights, Education Department, Washington, D.C. 20201.